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MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120

July 1997

SIMPLE SEAPLANE SETUPS

Ziroli's STEARMAN

The master's PT-17 in kit form

DUEL to the DEATH!

...without destroying your model

—Page 36

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Nick Ziroli Plans Stearman —page 52

ON THE COVER: *main photo—the Stearman PT-17 biplane with its many civilian and military paint schemes to choose from is a popular subject for giant-scale modelers. Here, the Ziroli Stearman in Navy N2S colors strikes a classic flight pose (photo by Walter Sidas). Inset: midairs on purpose? That's the name of the game in slope combat; see page 36 (photo by Dave Garwood).*

Reviews

Columns

EDITORIAL

by GERRY YARRISH

SPREADING OUT

I did something recently that really expanded my outlook on our hobby. I joined a second R/C club. Not that I have anything against my old club; I've been a member of the Fairfield League of Yankee Radio Controllers (FLYRC) for over 20 years and I remain heavily involved. Yet I began thinking about finding a larger field because some of my models have gotten so big. After looking around, I found a club with a larger field but it was farther away from home—no matter. I approached the guys at the Central Connecticut R/C Club (CCRCC), got an application and became a member. Wow! You know what happened? I didn't lose any old FLYRC friends; I met and made a whole bunch of new ones. What a concept. The number of fellow R/C builders and flyers in my private modeling world more than doubled!

Sometimes I feel that when we are in situations that are old and comfortable, we tend to stay there, fat and happy. "Hey; I have a club and a flying field to fly from. What more do I need?" Sure the field may be a little on the short side and I can't fly my big stuff there, but I know all the other members and we get along—at least, most of the time. I never really went out of my way to get to know some of the other modelers in our region. Those CCRCC guys up north of us were, well, those other guys. When CCRCC accepted me as a member, my view of the other guys changed. I was now one of those guys up north of FLYRC. Cool!

Let's see now, I have two flying fields to fly from, I have more than twice as many modeling friends as before, and something even more important has happened: I've become a tie between two R/C clubs. Since I've joined CCRCC, others from my old club have taken the step to check out CCRCC. Some have made the same new friends I have made, and a few have even become members. Sure, I've had to learn some new names and remember which club meets on which night, but I'm flying R/C a lot more and finding expanded opportunities to pursue the kinds of modeling discussion and projects I enjoy most.

Consider checking out your neighboring R/C clubs. The rewards will be well worth the effort.

Slope-soaring combat. No streamers! Knock the others out of the sky. See page 36 for more.

GREAT R/C DESIGN CONTEST

I hope all you talented designers out there have been busy, because the deadline to submit your entries to the Great R/C Design Contest is July 15, 1997. As a reminder, to be eligible, all entries must be original designs that have not been published or manufactured. There is no restriction to the size or type of model you enter, as long as you are an amateur modeler. Commercial and professional modelers and manufacturers are not eligible. Entrants must be prepared to submit a complete construction article on their designs, including good black-and-white construction photos, full-size plans and color slides of the model, both on the ground and in the air. Don't delay; your design could be the next big-time winner.

IN THIS ISSUE

For something totally different, how about slope-soaring combat? More akin to an aerial demolition derby than your typical R/C combat event, in slope-soaring combat there are a whole lotta midairs! But what makes this fun is that the models don't break; they're made of EPP foam. Wait till you see this one. You're gonna love it.

Also, we have another great little Speed 400 electric-powered warbird for you to build—a Grumman Hellcat. Designed by Jim Ryan, this 1/17-scale F6F is just too cool for words. Turn to page 70 and get your workbench cleaned off.

TROPICAL JETS

This month, we bring you a taste of the tropics. Check out Chris Chianelli's coverage of the Jets Over Argentina. Exotic jet aircraft in a tropical setting; Chris brings us close to the people, the place and the passion.

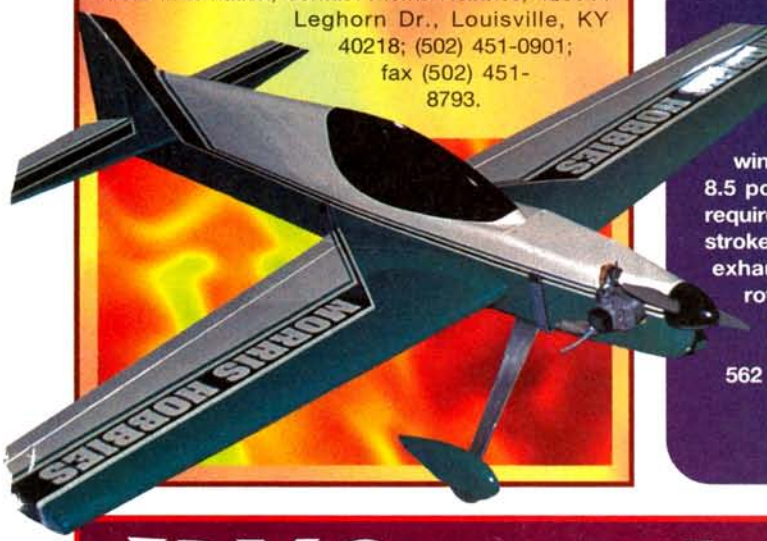
AirSCOOP

by CHRIS CHIANELLI

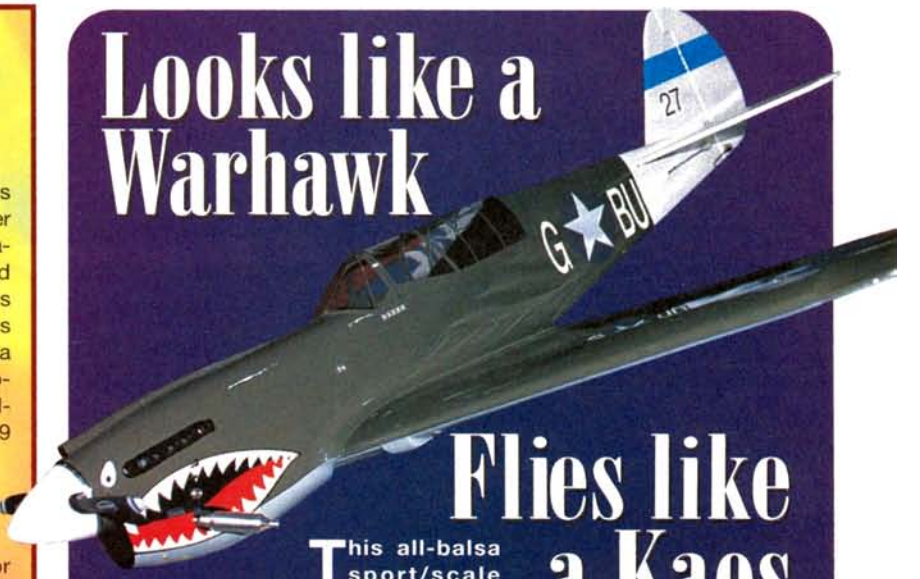
New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

Super Nova

Here's the new 1.20-size Morris Hobbies BalsaNova. Like its .40-size brother, this bigger version is an all-out fun-stunt machine that's capable of crisp rolls, snaps, extended knife-edge and just about anything else your thumbs are up to. This large model has a super-smooth stall, and landings are gentle and predictable. The kit features balsa and lite-ply construction, die-cut parts and photo-illustrated instruction booklet with CAD-drawn full-size plans. Specs: length—68.5 inches; weight—9 to 10 pounds; engine required—.91 to 1.20 2-stroke or 1.20 4-stroke. The IMAA guys will be happy the model can be built in 72- and 80-inch-wingspan versions (wing area—1,055 or 1,140 square inches, depending on version built). For more information, contact Morris Hobbies, 4200-A Leghorn Dr., Louisville, KY 40218; (502) 451-0901; fax (502) 451-8793.



Looks like a Warhawk



Flies like a Kaos

This all-balsa sport/scale P-40N from Direct Connection is designed for guys like you and me—sport flyers who want to do "strafing flybys" with an exciting-looking warbird but who have no interest at all in scale competition. There are a lot of us; this much is certain. Specs: wingspan—64 inches; area—724 square inches, weight—7.5 to 8.5 pounds; wing loading—24 to 27 ounces/square foot; radio required—4- to 6-channel; engine required—.61 2-stroke or .91 4-stroke. Kit features: detailed scale canopy, simulated 12-cylinder exhaust and ABS cowl. Optional flaps and Robart 90-degree rotating pneumatic retracts can be added. According to Direct Connection, this warbird flies like a Kaos pattern ship. For more information, contact Capstone R/C Suppliers Inc., 562 W. Schrock Rd., Westerville, OH 43081; (800) 593-5250; fax (614) 899-6070.

LDM Secret Weapon

LDM Industries has added the new Secret Weapon to its .40- to .46-size Combat Fighter Series models. Like others in the Combat Series, the Secret Weapon features: foam-core wing with plywood main spar; tough, extruded-PVC fuselage; and balsa tail surfaces. The kit includes an extensive hardware package and a detailed, step-by-step construction manual with over 75 CAD drawings. Reports are that the swept-forward design is good at snaring streamers and directing them toward the prop (to be cut). I also suggest (and I stick my neck out by speculating) that the radical wing configuration will enhance high-speed agility. For more information, contact LDM Industries Inc., P.O. Box 292396, Tampa, FL 33687-2396; (813) 991-4277; fax (813) 991-4810.

The ½A with big features

Just listen to the features and specs of this Norvel .061RC and see if it doesn't sound like a large R/C engine that has been shrunk in the dryer: barrel R/C carburetor with idle setscrew, pressure-tapped expansion-chamber muffler, Schnuerle porting, AAN cylinder and piston set, large-engine-style wristpin and conrod, beam mounts, removable glow-plug and reliable idle on low-nitro fuels. Both the .061 and .049 are available with and without the fuel tank/mount pictured here. Rumor has it, the price on this *little* engine will elicit very *big* smiles. For more information, contact Norvel, 2244 East Enterprise Pky., Twinsburg, OH 44087; (800) 665-9575; fax (216) 425-3935.

I'm happy to announce that House of Balsa is re-issuing its P-47 Thunderbolt and FW190A in its 1/12-scale series of warbirds designed for TD .051 to .10 engines. Like the other kits in the series, these two feature all-balsa and plywood construction, formed-plastic fuselage tops and canopies, photo-illustrated instructions, decal sheets, full-

Return of the Fighting 12th

size plans and scale 3-views; and they come with a free ½-ounce bottle of Zap-A-Gap. Specs: wingspan—36 inches; area—216 square inches; weight—22 to 28 ounces; wing loading—14.6 to 18.6 ounces/square foot. These two seem to be perfect candidates for the fully "throttleable" and muffled Norvel .061. For more information, contact House of Balsa Inc., 10101 Yucca Rd., Adelanto, CA 92301; (760) 246-6462; fax (760) 246-8769.

RETURN OF Micro Gear

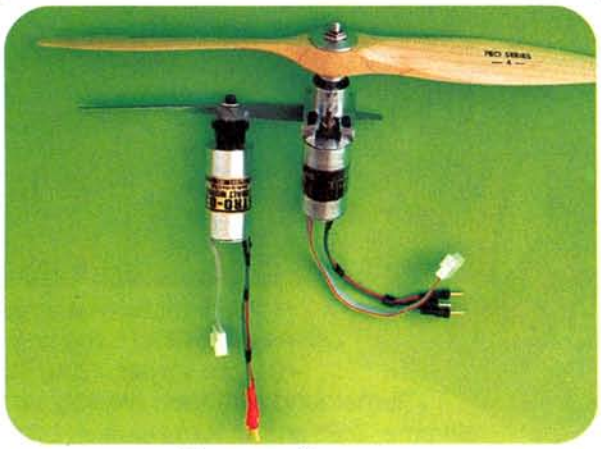
Some of you will remember these micro retracts from Robart; some of you won't. Quite a few years ago, they were very hot. Now, back by popular demand—because of the recent rise in small-plane interest—these little gems are perfect for House of Balsa's 1/12-scale series and any other ½A design that strikes your fancy. These low-profile mechanical units (main gear and nose gear are both operated with miniservos) will fit into small wings and fuselages.

- Main-gear features: positive down-lock; variable geometry of 85- or 90-degree retract angle; and a weight of only 0.9 ounce per pair.
- Nose-gear features: positive down-lock; full-range steering; 90- or 100-degree retract angle; and a weight of only 0.5 ounce.

For more information on these cool little units, contact Robart Mfg., 625 12th St., St. Charles, IL 60174; (630) 584-7616; fax (630) 584-3712.

I tell ya, this electric-powered, multi-engine scale phenomenon is really creating tremendous excitement. The possibilities seem endless. This new Speed-400 powered P-38 from Electric Flight Products is just one fantastic example. The P-38 is reported to be very easy to build (see *Model Airplane News* construction article, January '97); add to that the 99 percent reliability of electric power, and this model makes an ideal first twin. It's based on the semi-kit concept, which optimizes value by including only the laser-cut wood, foam-cores, canopy and decals. The builder supplies such items as the wing sheeting, nose block and triangle stock, so he can hand-select the balsa stock that's to his liking in terms of price and weight savings. Though it was designed specifically for inexpensive Speed 400 motors, the model can also be built as a powered scale slope soarer (PSS), or for glow power. Specs: wingspan—50 inches (Eppler 205); area—340 square inches; length—36 inches; weight—40 ounces; wing loading—16.5 ounces/square foot; radio required—3-channel. For more information, contact Electric Flight Products, 127 South Oaklane Rd., Springfield, IL 62707.

Silent Lightning



Astro Brushless 020

Leave it to AstroFlight to put super-efficient brushless technology into a Speed 400-size motor. The new 020 is 1.75 inches long and 0.95 inch in diameter, it has a shaft diameter of 1/8 inch, and it weighs 2.3 ounces. Specs: speed constant—3,340rpm/volt; winding resistance—125 milliohms; no-load current—800 milliamps. The matching, all-digital, micro speed control weighs only 1 ounce! The 020 turns 16,000rpm direct-driving a 6x3 prop on 7 cells and 5,000rpm on a gear-driven 11x7. I bet it's a foregone conclusion that the new Astro 020 will give any model designed for a Speed 400 blistering performance. For more information, contact AstroFlight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637.

TX Poser

Ever have some big-footed clod crunch your transmitter antenna while you were busy checking control-surface throws by operating the transmitter while it was flat on its back in the pits? I have. Some transmitters have a collapsible stand on the back; most don't. I've always liked the ones that do. They rescue antennas from exile in the grass. With Dave Brown's TX Poser, every transmitter can now rise from the dirt with dignity. Molded of lightweight, durable plastic, this very inexpensive unit can be mounted quickly on any transmitter. Contact Dave Brown Products Inc., 4560 Layhigh Rd., Hamilton, OH 45013; (513) 738-1576.

Rise from the dirt with dignity!

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 100 East Ridge, Ridgefield, CT 06877-4606; email: man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous number of letters we receive, we can not respond to every one.

SOMETHING TO BUILD

I've been meaning to write to you for a long time. I'm enclosing a copy of the January 1971 issue of *Model Airplane News* to make a point. Walt Schroder was the editor then, and the cost was 75 cents. Among all the articles, there are plans for two R/C models, a U/C model and a free flight model. My point is this: in a country with over 200 million people in it, I find it extremely hard to believe that you can find only one model plane a month with plans worth publishing.

I scratch-build my planes, some from my own plans. At the moment, I'm finishing up a model called a Dot that I built from 1981 *Model Airplane News* plans. I have been building model planes since the 1930s and have been flying R/C since the 1950s. I am not one to criticize how one does his job because I'm on the outside looking in, but if an idea for improvement can be passed along, why not?

I've enclosed a picture of one of my planes. It has a 60-inch span (NACA 4412 airfoil) and is powered by a Fox .45. Flies great!

MIKE LOEW
East Islip, NY

You're right, Mike, the composition of model magazines has changed over the years. The hobby has changed, too, with some things becoming more popular while others have become less so. As we listen to our readership, we adjust the content accordingly to better serve the needs of our readers. LM

CHIPMUNK 3-VIEWS

The 3-view drawings that you publish in "Planes Worth Modeling" are collectors' items, and I always look forward to that page. I am particularly interested in the latest 3-view of the de Havilland DHC-1 Chipmunk shown in the April issue because I have a model on the building board.

Something that puzzles me is that this drawing clearly shows a green navigation light on the left wingtip. The aircraft shows "VT" registration of India, but I was taught that they fly in the same direction as we do, so that green light should be on the pilot's right as he and the aircraft progress through the international airspace. This would occur only if this model had been converted to a canard/pusher configuration. I should add that this is *very* unlikely. But who can say? because the drawing does not show the way the seats are facing (it also appears in the April issue).

RON OGREN
Orchard Park, NY

Would you believe me if I told you the green light was placed on the "wrong" side because Indian pilots in training flew inverted most of the time? Didn't think so.

You're right, Ron: the label for the navigation light is wrong. Thanks for setting the record straight. LM

P-38 MOTOR SYSTEMS

After reading Richard Bauer's letter in the May issue regarding series versus parallel wiring schemes for my Speed 400 P-38 design, I thought it might be helpful to present the results of performance studies that I undertook following publication of the construction article. The studies were done using ElectricCalc, and while not perfect, this is a useful tool for comparison purposes and one that field experience has shown to be reasonably accurate.

Parallel wiring is very popular for Speed 400 twins, and on the face of it, it looks like a bargain; only half as many cells are needed, and the current is still very manageable at around 20 amps (10 amps per motor). However, it's important to bear in mind that voltage losses increase by the square of the current (I^2xR), so parallel wiring carries a hidden penalty. Also, the 1000SCR cells I would have used for a parallel system are twice as expensive as 600AE cells, and they weigh twice as much. Therefore, if one assumes that more cells will be needed to compensate for the higher voltage losses in a parallel system, the parallel setup is both heavier and more expensive.

The table summarizes the results of my studies. The weight and wing loading were adjusted to reflect the weight of the different battery packs, and the props were adjusted to try to stay close to 10 amps per motor while maintaining a good balance of top speed and rate of climb.

While the various combinations have their relative strengths, I consider my chosen setup of 7.2V motors running on

PERFORMANCE COMPARISONS FOR RYAN'S P-38 LIGHTNING

Power system	Props	Battery weight (oz.)	Max current (amps per motor)	Top speed (mph)	Max rate of climb (ft./min.)	Cruise duration at 35mph (min.)
2x7.2V, 16x600AE, series	6x4	11.0	10.0	50	882	10.2
2x6V, 14x600AE, series	6x3	9.5	11.0	45	857	6.9
2x6V, 14x600AE, series	6x4	9.5	12.3	50	936	8.9
2x7.2V, 9x1000SCR, parallel	6x4	13.5	10.9	53	971	9.0
2x7.2V, 10x1000SCR, parallel	6x3	15.0	11.2	50	1077	8.0
2x6V, 7x1000SCR, parallel	6x4	10.5	11.5	49	811	6.9
2x6V, 8x1000SCR, parallel	6x4	12.0	10.3	53	836	9.2

16x600AE cells to be the best compromise of speed, rate of climb, endurance and light weight. Furthermore, since it's the only combination that doesn't exceed 10 amps, I have no fear of damaging the motors or the cells. After nearly 50 flights, my motors are still in good condition. The 10x1000SCR system that I first contemplated certainly promises impressive climb performance, but endurance is not as good, the aircraft weighs 4 ounces more, and current is a bit on the high side. Note also that the 6V motors have better cruise endurance with 6x4 props than they do with 6x3s, but the full power amps are uncomfortably high.

I hope this comparison helps to illustrate the relative merits of several viable power options for a particular aircraft. There's room for personal preference, but my chosen system has worked very well.

JIM RYAN
Cincinnati, OH

Thanks a bunch for your letter, Jim. You're right; this is the sort of data that's needed to make these decisions. I'm sure our readers will benefit from your input. LM

LIKES THE BEE

That Bee 314 designed by Thayer Syme is a beaut! Are there plans available? It would be a shame if there weren't.

PHIL BUCCIERI
Minneapolis, MN

Yes, Thayer's Bee is a quite a model; glad you liked our "Readers' Gallery" coverage of it. But it is a "one and only," and since the fuselage is hand-carved from foam, there are no plans for it. LM

MORE OTTER DOCUMENTATION

I noticed that Paul M. Adams of Warrensburg, IL, requested the documentation of a subject aircraft in the May '97 *Model Airplane News*.

He was referred to "The deHavilland Canada Story" as a source. This may be a good general reference book, but there is one published (144 pages) covering the DHC-3 Otter specifically. It has a complete production list of the 466 Otters built, their users (such as military governments) and all the commercial users until 1967, when production was halted. Subsequent owners up to the late 1980s are also listed. This book also has photos of most of the aircraft (some in color).

If he would like to run one down (they are now out of print) it's titled "De Havilland Canada: DHC-3 Otter" by Irish Air Letter and published by Karl E. Hayes. It was printed by Iona Print Ltd., 33 Botanic Rd., Dublin, Ireland 9. It carries the ISBN# 0 9508231 04. Because it's been out of print for so long, it may be difficult to find a copy. In that case, he can write me, and maybe I can help.

ED LITKE
Calgary, Alberta, Canada

Thanks for the information, Ed. I was unaware of the existence of this book. For those wanting to write to Ed, send correspondence to us at Model Airplane News, *100 East Ridge, Ridgefield, CT 06877-4046, and we will forward it to him.* LM

TINY T-6

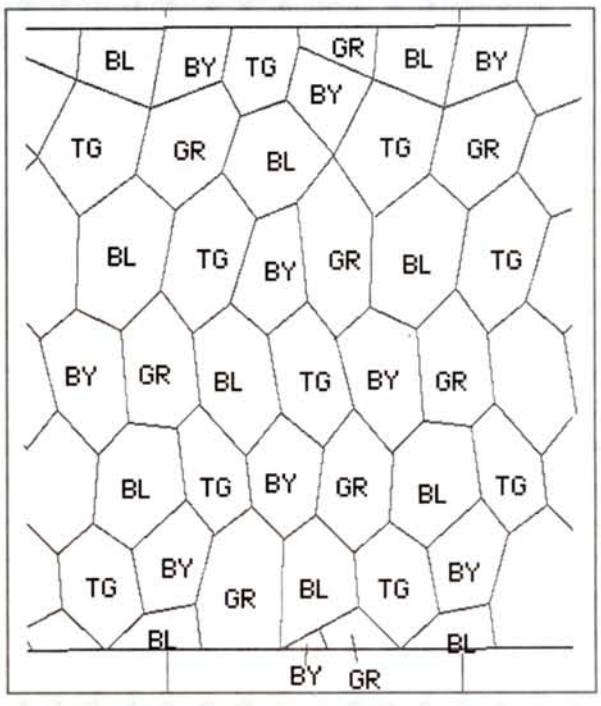
For years, I've been looking for an AT-6 kit or plans that are for those of us who are more interested in small R/C rather than the monsters. Finally, on page 60 of your May 1997 issue, there is a picture of a small T-6 that is identified as a House of Balsa product, but nothing in the article or in your advertisements indicates how a House of Balsa kit or plans for a T-6 can be obtained. Can you provide a source of small T-6s?

CARL YEATON
Belgrade, ME

The photo you're referring to was in our coverage of the Small Steps event by Randy Randolph. It's exciting to see a resurgence of interest in smaller aircraft.

House of Balsa (10101 Yucca Rd., Adelanto, CA 92301; 619-246-6462) sells a 44-inch-wingspan T6, an example of which was featured in Randy's coverage. Ace R/C (116 W. 19th St., P.O. Box 51, Higginsville, MO 64037; 816-584-7121) also sells a T-6 (35-inch wingspan) that is part of their Simple Series of kits. Both are available through hobby shops and mail order houses, or you can contact the companies directly. LM

Our apologies to Guy Fawcett and readers of his WW I "Lozenge Camouflage" article (June '97 issue). We inadvertently omitted the lozenge template diagram needed to use his technique. Enlarge this diagram 200% for a 1/6-scale template of that pattern. LM



Pilot PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1997. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606.

JUG WITH A CLUB

Andrew Gibson of Jacksonville, FL, built this 80-inch-span Yellow Aircraft P-47. The model features a fully detailed interior cockpit, an electronically retractable canopy, a fuel tank and bomb drops, working navigational lights, a detailed dummy radial engine and machine-gun and bomb-drop sounds. A G-62 powers the model, and nine servos take care of the standard controls and special effects.

FACETMOBILE

John Carpenter of Whitefish, MT, was inspired to scratch-build this Facetmobile after seeing a photo of a rubber-powered version in a '96 issue of *Model Builder*; he found drawings and photos to make the plans in *Sport Aviation* and *Flight* magazines. The 3½-pound model is 36 inches long, has a 30-inch wingspan and uses elevons and rudder for control.

SIZZLIN' LIZ

This Top Flite Gold Edition P-51D is the handiwork of Martin Barbier of Zoetermeer, the Netherlands. The model is finished in fiberglass cloth and has panel line and rivet details, functional flaps, a detailed cockpit, Robart retracts and Robostruts. It's powered by an O.S. .91 Surpass. Mohan Noordermeer, a friend of Martin's, painted the model.

BONNY BIPE

Pete Fenis of Old Forge, NY, built this Super Skybolt from a Great Planes kit. He covered the model with Sig Koverall and finished it with Sig butyrate dope. The bipe features a Don Harris smoke system, and Pete says, "It attracts a lot of attention at the field and is a great flying plane." An O.S. .91 Surpass powers the plane.

MIDWING MONOPLANE

Bud Pannier of Salt Lake City, UT, was inspired to build this Staudacher 300 GS by Budd Davisson's "The Acrobats" article in the February '96 issue of *Model Airplane News*. The Dick Hanson Models kit features a balsa, plywood and fiberglass fuselage with foam-core wings. Bud dressed the Staudacher in MonoKote and K&B Superpoxy. A Saito 182 twin 4-stroke engine with onboard glow ignition powers the model through the sky.

JET OVER TEXAS

Rob Ritter of Campbell River, British Columbia, Canada, built this F-16 from a Combat Models kit. It's equipped with Robart retracts with shock-absorbing landing gear and, with a Magnum Pro .61, has been clocked at 97mph. Rob entered the model in his first stand-off-scale contest and won first place. Congratulations!

DIRTY BIRDY

Sergio Toró of São Paulo, Brazil, sent this photo of his 64-inch-span sport model. It has a fiberglass fuselage and foam wings and is powered by an O.S. .61 SF ABC engine with a Carl Goldberg Models tuned pipe. Sergio created the graphics using a computer and painted them with automotive paint.

END OF THE LINE

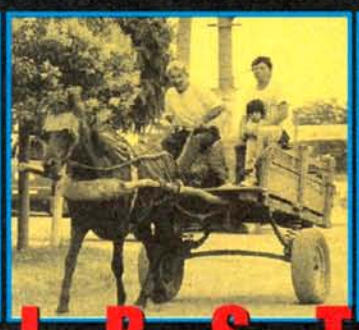
This 1965 VK Cherokee is one of the last 500 kits Proctor Enterprises produced before discontinuing the kit. Ray Randolph of Houston, TX, built the model and outfitted it with an Enya .53 4-stroke and covered it with Oracover. Ray says that the model "is a real pleasure to fly and, with the 4-stroke, looks and sounds scale."

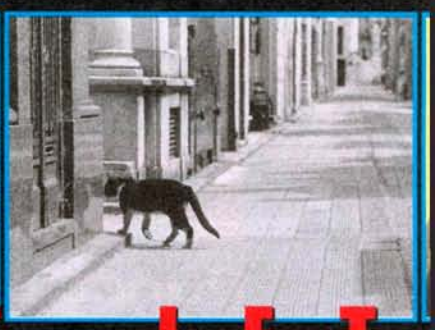
MIDWEST AEROBAT

Greg Minden of Las Vegas, NV, modified this Midwest Giles 202 into a G-202S single-seater. He writes that a YS 1.20 engine pulls the 10¾-pound model "straight up and outta sight" and that his G-202S is the "best flying airplane ever with an unbelievable roll rate."

WORK IN PROGRESS

Laddie Mikulasko of Dundas, Ontario, Canada, sent this photo of his scale model of the Cierva C.8L-II autogyro. The 7-pound, balsa, spruce and plywood gyro has a 6-inch-diameter rotor and uses a Saito .50 4-stroke for power. Laddie says that the Cierva model has made only short hops into the air thus far; more testing is needed.

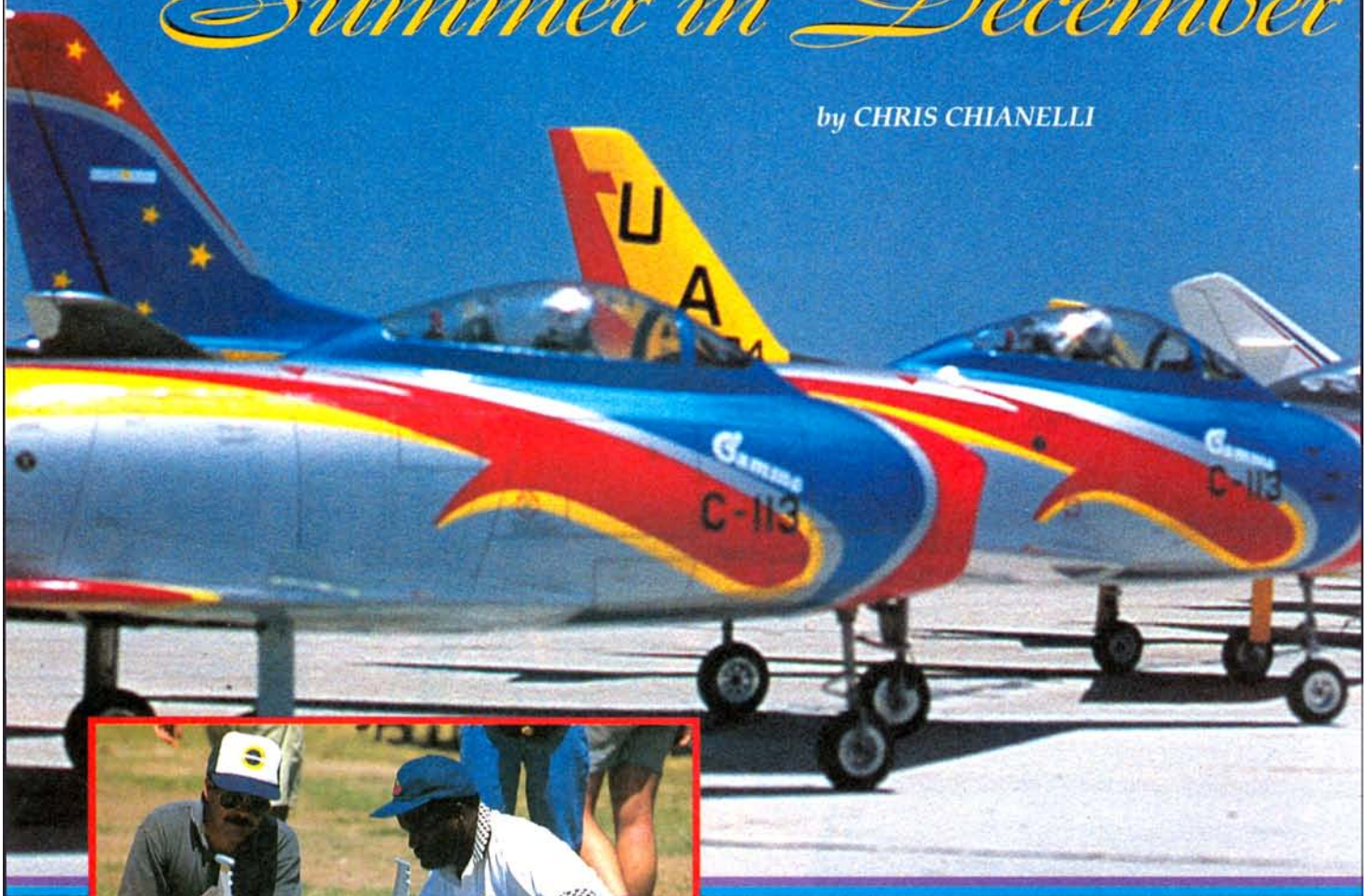




THE FIRST JET ARGENT

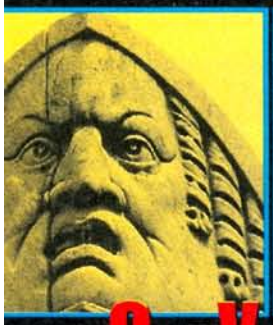
Summer in December

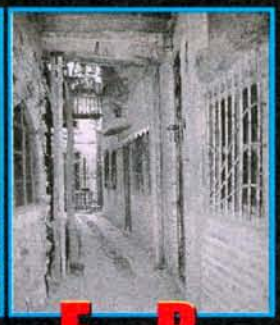
by CHRIS CHIANELLI



Top Gun-class pilot Charlie Chambers (right) and his Turbomin-powered F-15 flew fantastically. As the weekend progressed, however, Charlie's flights had to be cut short. Like many other pilots with kerosene-fueled turbines, he had problems with impure fuel. Even expert mechanic and turbine specialist Pepito Travieso was perplexed about an immediate solution to the problems the tainted fuel had caused.

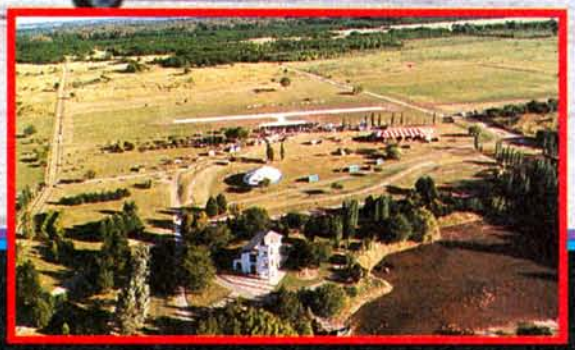
NO MATTER WHERE I go (and I've been around a bit, you know), I find that modelers are modelers. Sure, modelers from Argentina do the tango while modelers from the Bronx do the Macarena. Other than that (and arguing who had the best fighter of WW II or Desert Storm), modelers truly have a lot of common ground. Almost like musicians and their music ... almost. They're generally friendly, ready-to-help individuals who, for the most part, have a fantastic time laughing at themselves and one another. This time, I didn't go to either "side" of the world, I went to the other end of it to further my investigation of this "universal modeler mentality" theory of mine—Buenos





OVER
INA

Event organizer Gustavo Campana's F117 from Aviation Designs was another great flyer. On one of its flights, the throttle stuck, so Gustavo flew it out of fuel and then made a picture-perfect touchdown.*



Andreas Gietz with his all-new, turbine-powered F-86 Saber from Fiber Classics. The model's molded-in detail is impressive.*

Aires, Argentina, to be exact. Buenos Aires is about the same number of degrees latitude south of the equator as the northern coast of Tasmania; we're talking *way* down under!

It was December, and it was summer. Pilots came from around the globe to enjoy the idyllic flying environment. The U.S., Argentina, Japan, Puerto Rico, Switzerland, Brazil, Austria, Colombia, New Zealand, Venezuela and Chile were all represented.

The event was held at the picturesque Campanopolis Village, a mini-Disneyland-like ranch that had an unobstructed, almost perfect flying site with a paved runway measuring 400 feet long and 23 feet wide. The spectator area was replete with food stands, model vendors and souvenir booths. The event was organized and hosted by Gustavo Campana, with much assistance from his gorgeous girlfriend, Cecilia Benchaya, and two gracious gentlemen, Hugo Bustos and Andres Girabel.

JETS OVER ARGENTINA

Never before had I been around so many turbine-powered models at the same time. JPX, Turbomin and Sophia were all represented. Of course, there were plenty of ducted-fan craft. The one and only technical-support problem of the entire event was that some bad fuel for the kerosene-powered turbines found its way into the pit supplies, and this resulted in many fouled fuel-delivery systems. In no way did this damage the turbines, but a good de-gumming of pumps, nozzles and injectors was in order. Unfortunately, the beautiful Japanese 747 never did get off the ground in spite of many attempts, fuel-pump changes and late-night workshop sessions. The Japanese team are to be commended for their tremendous tenacity and for keeping exceedingly good spirits throughout their technical ordeal. I've seen many Turbomins and Sophias perform well at past events, and the polluted fuel really did some of them in. On a brighter note, all the propane-powered JPX units performed flawlessly.

Gustavo Campana (in front with hat on backwards) and his courteous staff in tropical green. Back row, second from right: USA team's Charlie Chambers (dark blue Turbomin cap), Pat McCurry (camo hat) and Garland Hamilton (red USMC cap).

This meet was a low-key, goodwill fly-in—my favorite kind. Some of the fun events were the speed runs and the short-takeoff competition. Our very own ready, willing and extremely able U.S.

JAPAN'S GREAT EFFORT

The Japanese team, Hiroshi Hoya and Tetsugi Okumura, showed up with their 125-inch-long, 136.6-inch-wingspan, 44-pound Boeing 747. The twin Sophia J450 turbine-powered jumbo jet was designed by Hiroshi and former O.S. designer Hiroyuki Oki (not shown) and is constructed entirely of fiberglass. It was a disappointment that Tetsugi, the pilot, didn't get to show the Argentineans what the big bird is capable of because some bad fuel dissolved the O-ring seals in the electronic fuel pumps. The tenacious Japanese worked into the wee hours of the morning trying to convert the J450s to a pressurized fuel-delivery system—a system that has been used by Sophia in the past.

By the next day, however, the fuel impurities and dissolved O-ring material had started interfering with the turbine's injector nozzles, and that was that. Through it all, the Japanese remained in good spirits and never once let their frustrations come between them and their fellow flyers or the inquisitive spectators. Having journeyed all the way from Japan, I think these guys deserve the "Sportsmanship of the Year Award." All the jets with kerosene-fueled turbines, no matter who the manufacturer, had similar problems.

For those interested, rumor has it that Sophia has developed a revolutionary CPU (central processing unit) that incorporates ESC/pump, rpm monitoring, throttle-slow logic, high and low speed limits and EGT (exhaust-gas temperature) monitoring with safety cut-off and auto-start mode. Those who would like to know more should contact Sophia at (818) 359-9527.

The event's "first lady," Cecilia Benchaya, was a superlative host and an excellent tour guide because she's an expert on the history of Buenos Aires and knows the tango hot spots. A refined woman with an a brilliant sense of humor—and beautiful!—for me, she exemplifies the people of Buenos Aires. I think I miss her the most ... (sorry Gustavo!).

Some of the jets that wowed the crowd! Above: Garland Hamilton's BVM Aggressor III "dirtied-up" and on final after 230mph+ screaming speed-dives. Right: after an incredible full-brake/full-power 33-foot takeoff, this F-16 climbs at 45 degrees—flown by Norberto Tenorio of TNT Models (see main text).*

Marine Garland Hamilton really wowed the large crowd with his "on-the-deck" screaming passes through the speed traps with his BVM Aggressor. When I say fast, I mean fast—230mph+! Garland takes his Aggressor so high that I needed to follow with my 300mm lens just to see where it was. It looked like a grain of pepper! Forget about figuring out what it was doing. For that, I'd need a 3,000mm lens! From this great height, Garland power-dives straight at the ground, does a smooth pull-out so as not to lose too much speed and then comes level just before the first trap as he nails it straight across the traps at about 20 feet off the deck. Very impressive. Now I know why he's nicknamed "Sgt. Major Danger." But the only thing that might have been in "major danger" was his Aggressor. Garland's first and foremost concern is the safety of those around him. He always places a large margin of safety between himself and the model and between himself and the pit area. I've witnessed Garland and his BVM "speed machine"

Although this was a jet meet, it wasn't strictly a jets-only meet. Gustavo feels that there should be demos to highlight other forms of R/C, and I agree. The 1/3-scale Extra 300 shown here in knife-edge was impressive. Nick Ziroli's name is known even in the southern hemisphere. This B-25 flew well and looked great.

Team Latino! From the left: Felipe and Hulvia Vidal, Louis "Luccio" and Cintia Ontevero. Felipe is responsible for the next Jets Over Puerto Rico on August 1, '97. Felipe, Luccio and Gustavo are working hard to expand the South American R/C event circuit to Brazil and Chile. I'll keep you posted on any late-breaking news. Below: I asked Felipe what was up with this landing. "That's no landing; that's a full-scale maneuver. The Puerto Rican government uses the F-86 for crop dusting. I swear, Chris, it's true!"

The Swiss team (Reto Senn, Franz Walti and Peter Rutiman) showed up with two beautiful, unique turbine-powered subjects. The 79.2-inch-long, 59.4-inch-wingspan Hawker Hunter (below right) designed and built by Reto, was powered by a JPX 260. This sleek model was smoothly piloted all weekend by Reto. The team's other model was a Rafale (below left). This masterpiece was designed and built by Franz. It weighs only 25.5 pounds because it was built totally of honeycombed fiber/epoxy. It featured twin JPX power with custom-built fuel-delivery system, operational canards and incredible detail throughout. On the first flight, disaster struck. The transmitter simply stopped putting out a signal, and the CD's monitoring scope went blank. The Rafale went straight in. The radio was a very high-end model manufactured a by a well-respected company that will remain nameless. This could happen to any radio system, regardless of the maker, and it shows that we should never get over-confident about our radio link. Franz and the team took the disaster very well.

Either the Campanas are very important people or the President of Argentina loves model airplanes! That's right; Argentine President Carlos Menem (center) flew in by helicopter and stayed for quite a long time. Meeting him was a real treat. On the left are Garland Hamilton and Pat McCurry, and on the right are Charlie Chambers and Pepito Travieso.

perform this feat many times at many events, and I've never seen him or his craft falter. Garland is as sharp as a tack, and his Aggressor is as solid as a rock.

Another man who impressed the crowd was Argentina's own Norberto Tenorio, owner of TNT Models* in Buenos Aires. Using his Byron-powered, lightweight TNT F-16, Norberto managed an incredible full-brake, full-power takeoff in 33 feet! It's true; his kits are reported to be of lightweight composite construction, but this was a first for me, and again, a real crowd-pleaser! That tenuous moment of liftoff was nerve-racking. The F-16 and other TNT kits were featured in last month's "Air Scoop." These kits may be coming into the States soon. Go back to the issue and take a closer look. Garland and Norberto's flying feats exemplified the light tone of the entire event. It was universally fun for all, no matter what your port of call!

Other entertainment included a power sailer, aerial pyrotechnics, tango dancers and many low passes by a full-scale Argentine Air Force Mirage III. I was standing right under the thing when my stinking lens broke! I hate it when stuff like that happens—really gets to me. I'll just have to go back next year and make good on that blown ultimate photo op.

The awards were of the "goodwill" nature. Here, the Swiss team receives the Technical Achievement trophy for their intricate and beautifully detailed Rafale.

Even though this was his first event, Gustavo Campana and company went all out to make the pilots comfortable and keep them well-fed. Yes, there was a minor glitch or two—extremely minor. The kind of things that can't be foreseen without first going through the process

JETS OVER ARGENTINA

The Chilean team

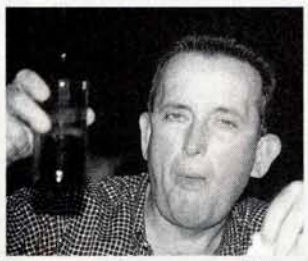
The Brazilian team

The Australian team

My gracious hosts. Top: the master of ceremonies Señor Campana (Gustavo's dad) rolled out the red carpet, broke out the finest his wine cellar had to offer and generally made sure his guests were all well tended to. Gustavo, as you can see, looks like his dad. Bottom: official wine taster, the congenial Hugo Bustos. These three made me feel like part of la familia and that Buenos Aires was my home. It's the Argentine way.

At Campanopolis Village, no one had to ask, "Where's the beef?"

On Friday, the pilots, their guests, pit crews and staff were treated to an Argentinian banquet. It included fresh Argentinian beef, homemade sausage of all kinds, beer and wine from Mr. Campana's wine cellar. Mix all of this with indigenous live music, and I could have jumped up on a table right there and started singing "Don't Cry for Me Argentina." Don't worry; I didn't.



Left: yours truly doing some after-dinner "field repairs" on a camera lense. Right: no one has to tell Felipe "Mr. Sosa" Vidal how to have fun; he knows!

Yet another feast, compliments of Señor Campana.

I believe I stumbled on an amazing discovery while down there. You know how right-hand patterns seem easier to fly for most of us American R/C'ers? Well, get this! That may be true only because we're in the Northern Hemisphere!

once—things like Chianelli likes his coffee with half-and-half!

While the hotels are different from what we're used to, they're not bad. They were very clean (no, the bathrooms were not at the end of the hall; each room had its own). You just won't find things like cable TV in most of the hotels—big deal. Buenos Aires has a European flavor—especially Italy (they even speak Spanish with an Italian rhythm)—and a flair for fashion with the mystique of the '50s. You could really turn attending this R/C event into a memorable vacation/adventure. The history is rich, the architecture is beautiful, the women are uniquely gorgeous, and the people are warm, well-mannered and classy.

I was given several wonderful tours, courtesy of Cecilia, Gustavo and Hugo. I even went to La Recoleta and put a flower on Evita's tomb—truly the travel experience of a lifetime.

No, wait; the article can't be over yet. I forgot to tell you something! I believe I stumbled on an amazing discovery while down there. You know how right-hand patterns seem easier to fly for most of us American R/C'ers? Well, get this! That may be true only because we're in the Northern Hemisphere!! ... right?

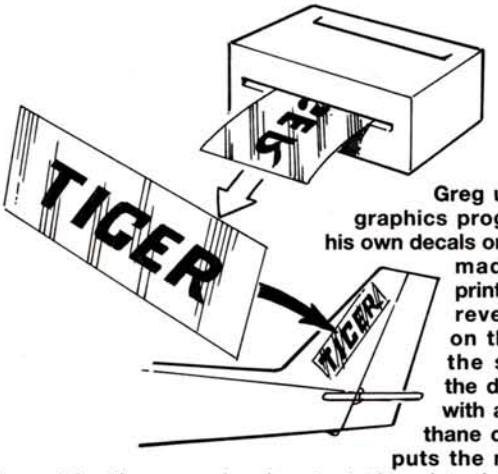
Special thanks to Aerolineas Argentinas, Lan Chile, Avianca, Lufthansa, VASP Brazilian and Transbrasil Airlines for pilot and model transportation and shipment.

Chances are, if there's a smoking hole in the ground, Luccio has been flying.

Hints & KINKS

by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



SLICK STICKERS

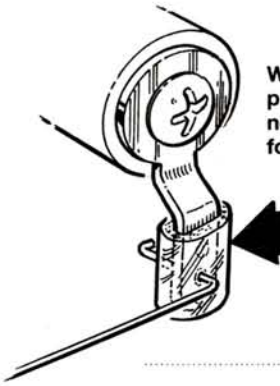
Greg uses a computer-graphics program to print out his own decals on clear-plastic film made for computer printers. He prints the reversed characters on the rough side of the sheet and glues the decal to his model with a thin coat of urethane clear varnish. This puts the nicer glossy surface of the film upward and protects the printer ink underneath. The edges of the decal are sealed with the same varnish applied with a small brush.

Greg Cooper, Skaneateles, NY

BOMBED OUT

Make airshow bombs out of foam coffee cups glued end to end with white glue and filled with powdered chalk or talcum. Cut a third cup to create a stabilizing fin, and paint the bomb with enamel or water-based paints. (Dopes cause foam to dissolve.) Note the crossed knife cuts; these ensure fragmentation so that the bomb "explodes." Be ready with a long extension cord and a vacuum cleaner!

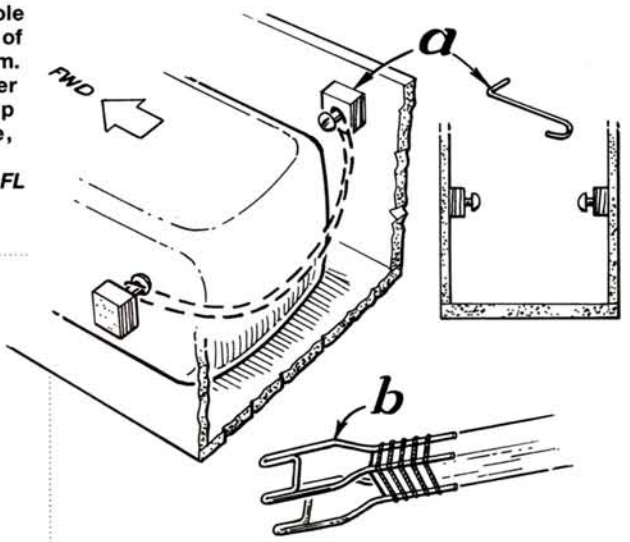
Charlie Rose, Weslaco, TX



NOT SLOPPY

When you use a very thin wire throttle pushrod, you can eliminate the looseness that's caused by too large a hole for the wire by slipping a short piece of rubber fuel line over the throttle arm. This provides an effective rubber bushing for the wire, takes up "slop" and works just fine, reports Kurt.

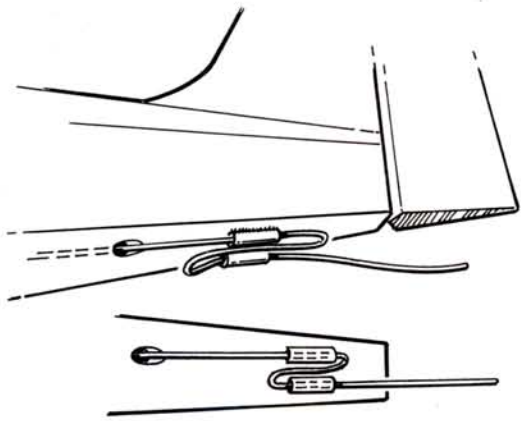
Kurt Provenza, Naples, FL



STRAPPED IN

Blocks with screws (a) or just wire hooks glued in allow a rubber band to be stretched across the rear of the tank to keep it from sliding back. A roll of sponge rubber ahead of the tank stops fuel-line pinch. The little rubber flyer's tool (b) made out of paper clips and a balsa stick puts the bands into the hooks. Put the band between the horns.

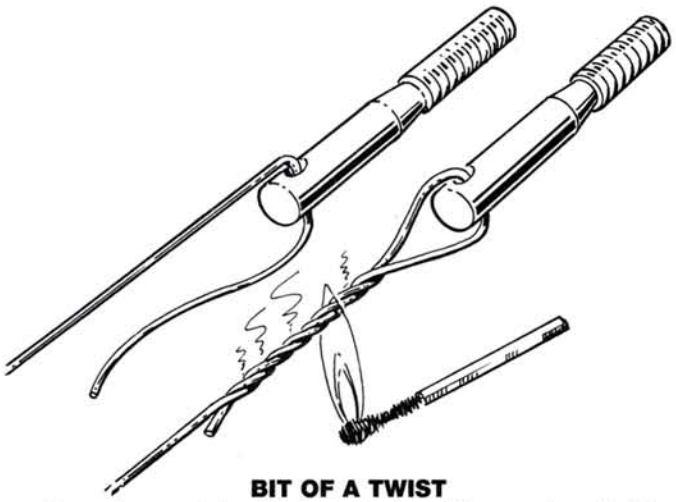
Stale Haugen, Lillehammer, Norway



ANTENNA TENSION

After running his antenna wire along or through the fuselage, David pulls it through two ½-inch (13mm) pieces of plastic tube. These tubes can be side by side or slightly staggered, and they will keep the wire tight, yet allow it to be easily removed.

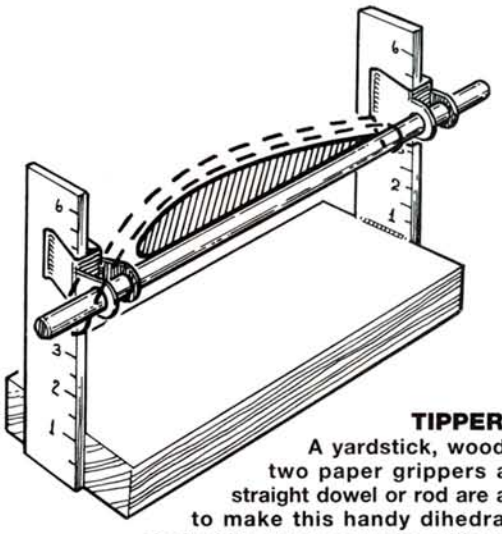
David Ben-David, Kiriat Haim, Israel



BIT OF A TWIST

Use nylon-coated cable in your closed-loop system, twist firmly as shown, then melt the nylon—don't burn it!—and you'll find that the nylon will be welded to itself and will hold securely.

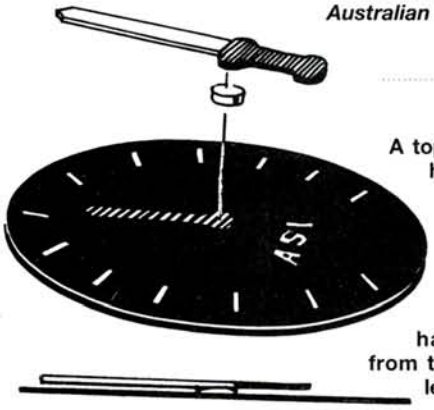
Eris Kennedy, Wanniassa, Australian Cap. Terr., Australia



TIPPER UP

A yardstick, wooden block, two paper grippers and some straight dowel or rod are assembled to make this handy dihedral jig. The dashed line represents the rubber band over the wing panels; if one gripper is moved up or down, it will compensate for built-in washout, too. Make two jigs—one for each side.

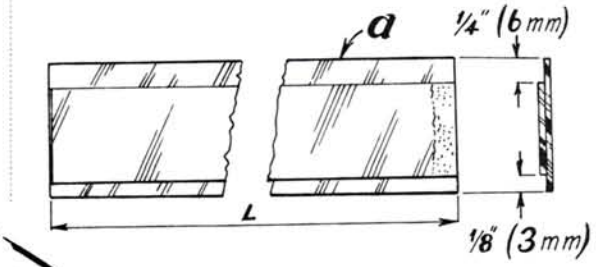
Don Bidgood, Frontenac, MO

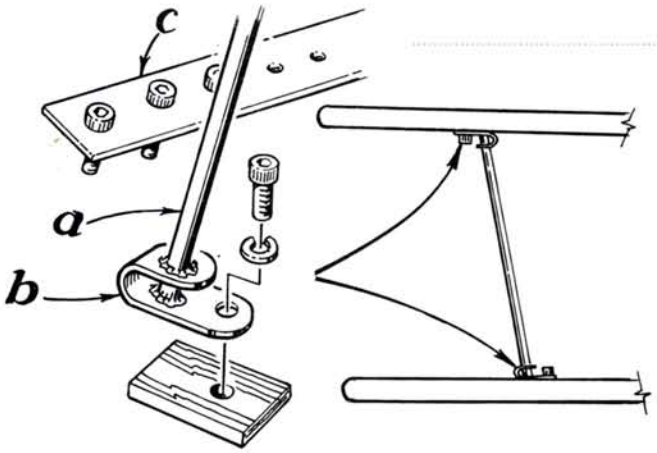


3D DIALS

A top scale modeler shows us how to black out the pointer of a photocopied dial, then cut a new pointer out of thin, white plastic or shim metal. Support the pointer on a slice of plastic rod. The dial will have to be spaced back from the instrument glass to leave room for the pointer.

Dennis Bryant, Burgess Hill, Sussex, England

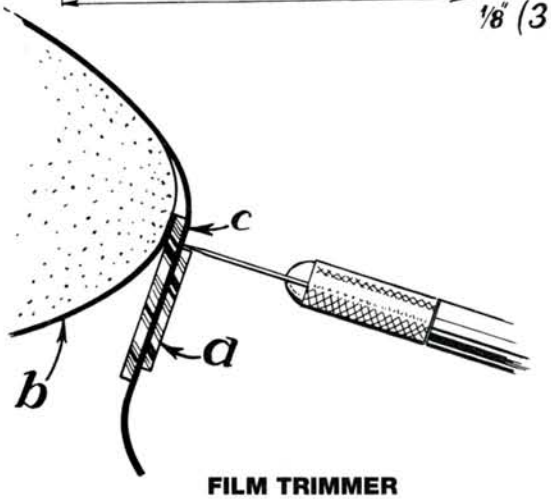




DO THE STRUT

These struts won't pop out and puncture your model's covering. The wire strut (a) is well-soldered into the brass clips (b), which are .025 to .032 inch (0.25 to 0.4mm) thick. Secure the struts with 4-40 capscrews, lock washers and T-nuts under the birch plywood plates. Ron carries his rigging screws in punched card strips, and a ball driver makes assembly easy. He also recommends balsa fairings for the wires.

Ron Ogren, Orchard Park, NY



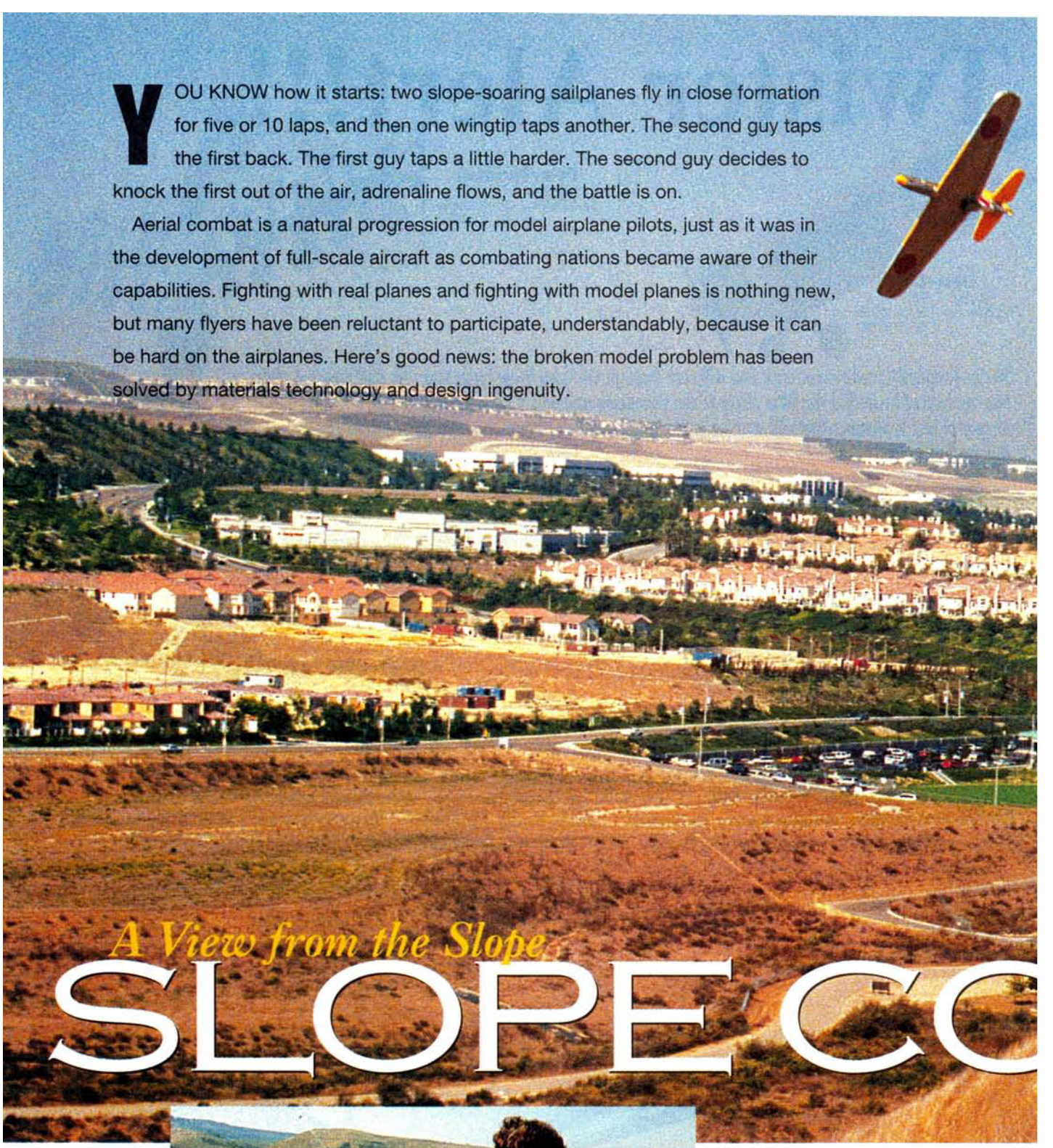
FILM TRIMMER

Two strips of thick plastic (a) glued at only one end create this handy gauge/protector for cutting very neat covering film overlaps. The offsets make differing widths of overlap, so Howard made two sets for 1/16-, 1/8-, 3/16- and 1/4-inch flaps. The bottom film (b) is protected while the overlapping top film (c) is cut.

Howard Herin, Bellingham, WA +

YOU KNOW how it starts: two slope-soaring sailplanes fly in close formation for five or 10 laps, and then one wingtip taps another. The second guy taps the first back. The first guy taps a little harder. The second guy decides to knock the first out of the air, adrenaline flows, and the battle is on.

Aerial combat is a natural progression for model airplane pilots, just as it was in the development of full-scale aircraft as combating nations became aware of their capabilities. Fighting with real planes and fighting with model planes is nothing new, but many flyers have been reluctant to participate, understandably, because it can be hard on the airplanes. Here's good news: the broken model problem has been solved by materials technology and design ingenuity.



A View from the Slope

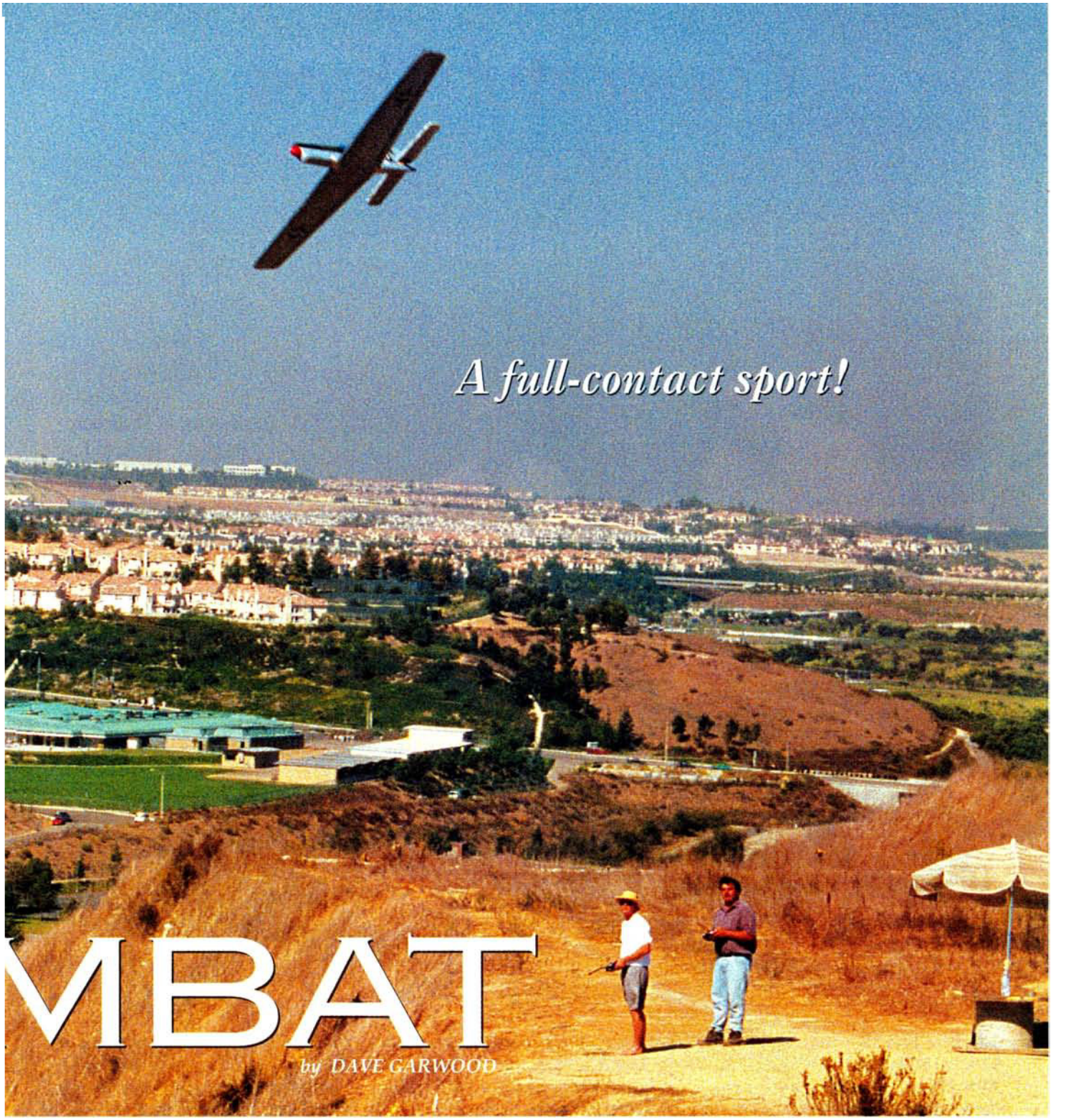
SLOPE CO

PHOTOS BY DAVE GARWOOD

Close-in excitement. Dennis Duncan's (left) Kawafoamie nails Dave Sanders' (right) FoaMe-109.

THE SEARCH FOR HIGH-SURVIVABILITY SAILPLANES

Back in the old days of slope combat, scoring methods were devised to reward the superior combat flyer and still preserve the sailplanes. An example is trailing streamers, as in control line combat, where a streamer strike was recorded as a kill. Streamer scoring required judges and was somehow less satisfying than full-contact combat.



A full-contact sport!

MBAT

by DAVE GARWOOD

Dave Sanders and Dennis Duncan fly Dave's Aircraft Works Kawafoamie and FoamWulf-190 slope combat planes at Laguna Niguel, CA.

Another scoring method involved counting the clearly audible event of one plane meeting another in flight. The aggressor was required to loop or roll after each contact to show he was still in control after the encounter. Again, judges and scorekeepers were needed, and personnel were not always available at informal slope combat sessions. And while this preserved planes, it didn't satisfy the blood lust present in our species since the Roman Empire—maybe since the cave. Slope-heads needed a way to simulate a battle to the death.

Some brave souls fought to the death with foam or balsa models of the day under simplified rules: hit the other guy and disable his plane or force him to crash. If you could repair your plane and re-launch within five minutes, you were still in the game. If you couldn't repair within the five-minute limit, you were out. Any number could participate, and sometimes teams formed. The teams lasted until there were but two planes left in the air.

This solved the problem of finding judges, but the slope world still needed an air combat scenario that allowed kills but didn't destroy your model early in the flying session. The answer was found in a new model construction material: expanded polypropylene (EPP) foam.

When this new foam was introduced

Dennis Duncan's Kawafoamie turns inside Dave Sanders' FoamWulf-190. Both EPP foam sailplanes were made from Dave's Aircraft Works kits.

into models in 1996, slope planes became tough enough to withstand midair collisions and survive crashes. Half a dozen makers released EPP foam combat slope kits, and these have brought slope combat into a new era. Now you can fight all day, and—win or lose—you still have a good chance of going home with a model that's flyable. Most of these designs also maintain one of the sterling advantages of slope sailplanes: they can use the cheapest servos and radios.

SLOPE COMBAT DESIGN HISTORY

The slope combat model that most remember from the 1980s is the Cheetah. The design philosophy here was to mount expendable wings and stabs to a bullet-proof fuselage. The foam-core wings were covered with Kromekote®—a thin card stock material—and the plastic molded fuselage was as tough as a Wiffle® ball bat. Parts for the wing and stabs were cheap, they could be built in a few hours, and the fuselage was nigh indestructible.

The Cheetah and its stretched-wing brother, the Super Cheetah, were fast and heavy planes and needed considerable wind to fly well. In the early 1990s, Jef Raskin's Anabatic Aircraft revolutionized slope combat by introducing very light planes that could survive impact and crashes *because* they were so light. Built quickly from white foam and sticks and covered with clear packing tape, these "foamie" planes flew in much lighter lift and from smaller hills.

Anabatic Aircraft signaled clearly what the new foamies could be used for when they introduced the Anabat Combat, which shipped two planes in a kit. This design itself and its promotional packaging introduced many to the joy and terror of aerial combat on the slope. These planes could clobber each other, smack into the hill, or make cartwheel landings and be picked up and immediately re-launched back into the fray.

Some said foamies were ugly. Some wanted heavier planes to fly in higher winds. The modern era of slope combat began with the introduction of EPP foam into slope aircraft design and construction.

Fur ball of three Dave's Aircraft Works EPP foam kits. All three went down after this collision. All three were picked up and re-launched immediately.

Pat Bowman, a government shipping manager, observed the favorable properties of EPP foam: it's light, strong and returns to shape after being distorted, even violently distorted. Pat learned to fabricate the material and in 1996 brought out the Ruffneck, the first EPP foam slope combat kit.

Following this lead, others have introduced EPP combat foamies, giving us plenty of choices. Dave Sanders added aesthetics to the emerging EPP combat designs, bringing scale-looking WW II warbirds to market.

HOW SLOPE COMBAT WORKS

Slope combat doesn't have a central authority responsible for codifying rules. It is evolving regionally and rapidly. One way to run a combat match, developed by the Laguna Niguel Slope Soaring Guild and spreading up and down the West Coast, goes like this:

A time slot is announced, and any number of pilots launch and attempt to knock others out of the air while maintaining control of their own planes. To demonstrate that he is in control, the aggressor pilot must immediately perform a verification maneuver: a loop or a roll. If both pilots perform verification maneuvers, no kill is scored. If neither pilot performs a verification maneuver, no kill is scored. If one plane goes down and the other pilot performs a verification maneuver, a kill is awarded.

Downed planes can be picked up and re-launched an unlimited number of times during the time slot. The pilot with the most kills is the winner. Depending on the number of pilots present, heats may be called by the contest director, and ties may result in fly-offs to determine a contest winner.

This method has caught on in southern California, and in 1997, there is a monthly schedule of slope combat events run this way. Are we having fun yet?

The EPP foam planes build confidence. Fred Mallett launches inverted with his DAW FoaMe-109 at Laguna Niguel Slope Soaring Guild's home hill.

ACM SCHOOL

Here are five lessons from the *Model Airplane News* slope Air Combat Maneuvering (ACM) flight school. Note that this is not a *basic* flight school; to be successful in slope combat, you'll need to have at least intermediate aileron flying skills: launching, landing, loops and rolls in slope lift.

1. Preserve your energy. The primary resource for air combat success is potential energy, either altitude or airspeed. In slope combat, we need enough kinetic energy to cause the opponent to "depart from controlled flight," as that's the way we make a kill, but more important, having potential energy gives you tactical options. You can dive on an opponent in a slashing attack and then get away quickly. You can pull violent evasive maneuvers. You can exit a bad situation and live to fight another day.

2. Watch the ball. Don't watch your own plane; focus on the opponent's plane, and watch your own with peripheral vision; this will help you set up an intercept. Just as in baseball, you don't look at your bat; you keep your eye on the ball.

3. Learn to recover from odd positions. Many air combat engagements end up in knife fights in which you're grimly slugging it out low and slow. This can quickly turn into the classic problem: "out of altitude, airspeed and ideas all at the same time." Practice recovering from this unhappy situation, and you'll be able to keep flying many times when you would otherwise have been on the ground. Push the nose down, fly out and away from the fight, gather some airspeed, gain some altitude, then re-enter the fur ball.

4. Keep flying the airplane. Sometimes, you lose sight of your plane. You may be distracted by other aircraft, or you may have flown below the hill, and now your heart stops because you don't see your plane. Keep flying. Fly *as if* you still know where your plane is and what it's doing, and you'll be surprised at how many times you're able to stay up. Never give up until you *know* you're down.

5. Fly computer sims. If you want to learn a lot about air combat quickly, fly computer flight simulators, particularly those that model WW II aircraft: the gun fighters—planes built before air-to-air guided missiles were invented. The very fastest learning will come from flying online multiplayer head-to-head air combat games like Kesmai's *Air Warrior* (see *Model Airplane News,* August 1994).

CONCLUSION

Not many things in soaring get the juices flowing like slope combat, but these specialized planes can also serve in a wider role. The EPP foam combat planes' ability to shrug off crash damage is highly useful in several other areas. Their toughness makes them top candidates for slope aileron trainers, as scouts over new and untried hills and as wind dummies—the planes launched first in the day to determine whether there is sufficient lift to fly. There's a lot to like about the new breed of foam combat planes.

MANUFACTURER INFORMATION

Here are some of the manufacturers of slope combat planes and the planes they produce.

AEROTECH

Anabat Combat	411 Beach Park Blvd. Foster City, CA 94404 voice (415) 573-9363 orders (800) 573-9363 email: anabat@best.com website: http://www.anabat.com

BOWMAN'S HOBBIES

Ruffneck	21069 Susan Carole Dr. Saugus, CA 91350 voice (805) 296-2952 fax (805) 296-9473 email: Ruffneck1@aol.com

DAVE'S AIRCRAFT WORKS

Foam-51 **FoaMe-109** **FoamWulf-190** **Kawafoamie**	34455 Camino El Molino Capistrano Beach, CA 92624 (714) 248-2773 email: 104271.3352@compuserve.com

MM GLIDERTECH

Ding-No **F-86 Sabre**	P.O. Box 39098 Downey, CA 90259 voice (310) 923-2414

RA CORES

Combat Gremlin	P.O. Box 863 Southbridge, MA 01550 voice or fax (508) 765-9998 email: reith@racores.com website: http://world.std.com/~racores

STUDIO 'B' GRAPHIC DESIGN

Foaminator **EPP'ee** **MiG-3** **Avro Vulcan**	P.O. Box 514 Kurtistown, HI 96760-0514 (808) 968-8721 email: StudioB@aloha.net

TRICK R/C

Zagi-LE **Razor** **B-2 Bomber**	938 Victoria Ave. Venice, CA 90291 (310) 301-1614 email: zod@zagi.com website: http://www.zagi.com

ZONE 5

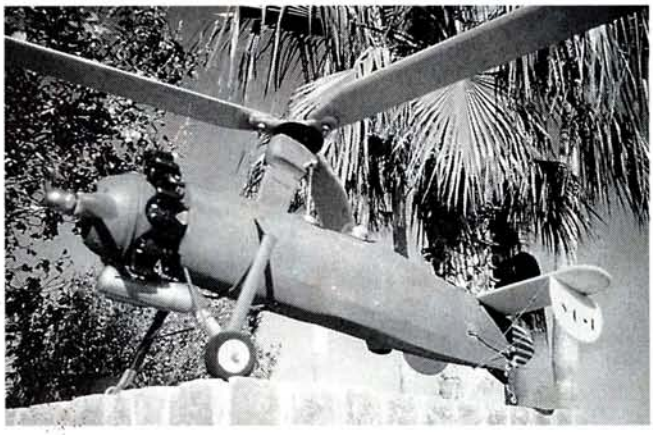
Cheetah **Super Cheetah**	41 Placitas West Rd. Placitas, NM 87403 (505) 867-3090

Fred Mallett's FoaMe-109 turns to attack Dave Sanders' FoamWulf-190

Golden AGE OF R/C

by HAL deBOLT

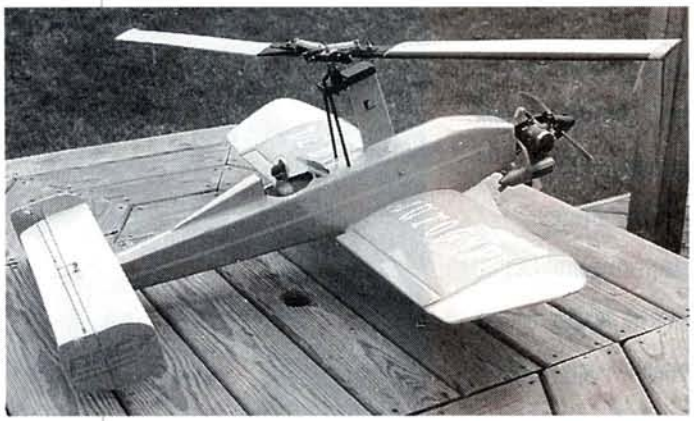
MAIL CALL



Steve Tillson of Phoenix successfully flies this scale version of the Kellett KD-1 autogyro. Progress!!

THE BIBLE SAYS, "Ask and you shall receive"; same seems to be true for our readers. Bill Young of Flagstaff, AZ, responded by sending his very comprehensive "R/C Autogyro Design Manual." Bill spent considerable time accumulating an extensive amount of published gyro info. He did us a great favor by dissecting from it all that would be pertinent for our use and assembling it in a useful manual form—just what every red-blooded gyronaut should have! You can get in touch with Bill at 4403 Rustic Knolls Ln., Flagstaff, AZ 86004.

More information on gyro basics can be found in the April '77 issue of *Model Aviation*, and construction articles are in the September '77 issue of *Model Airplane News*. The clearinghouse for gyronauts is Bill Friedlander at 1015 12th St., Hudson, WI 54016.



Frank Drecchio of Baltimore, MD, sent this photo of his Sunday Flyer Model Airplane News gyro.

Frank Drecchio of Baltimore, MD, wrote to thank us for his Sunday Flyer *Model Airplane News* gyro. In its fourth season, some of the gyro's modifications include a reinforced rotor hanger, a Kyosho car axle for the rotor spindle, rubber bands for blade damping and twin rudders. All seem an asset, as he has never crashed. A cute experience was when the rotor quit (no reason given) and he was able to safely land the model! Says something for winged gyros?

GOLDEN ANNIVERSARY

Harris Hill at Elmira, NY, could be the birthplace of soaring activity in the USA. Still active today, it is also the location of the National Soaring Museum. The museum has announced that they will commemorate the 50th anniversary of R/C sailplane flight at the hill. Several R/C sailplanes will be on display, including the original Hull-Bourne glider of 1938, one of the first R/Cs. An R/C sailplane symposium and flight demonstration will inaugurate the commemoration. Harris Hill is a very impressive flying site that you may have desired to visit; now you have a good excuse!

Hull and Bourne along with Clinton Desoto were associated with the American Radio Relay League (ARRL), the ham organization. In the early days of this column, I attempted to determine who flew the first R/C model. Strangely, no one stood out. Walt and Bill Good, Chester Lanzo and the ARRL people all appeared to have flown in the same time period. So it is significant that the ARRL glider is at Harris Hill. The Good brothers' Guff is in the Smithsonian, and the Lanzo Stick is in the AMA Museum. Nice to be able to see what started all this!

Should note that both Josh Grigg and daughter Linda sent thoughtful letters expressing their gratitude to the many modelers who honored John Grigg. Their loss was great, and it was also felt in modeling fraternity. John unselfishly did so much, and there was so much more he wanted to do; we all lost!

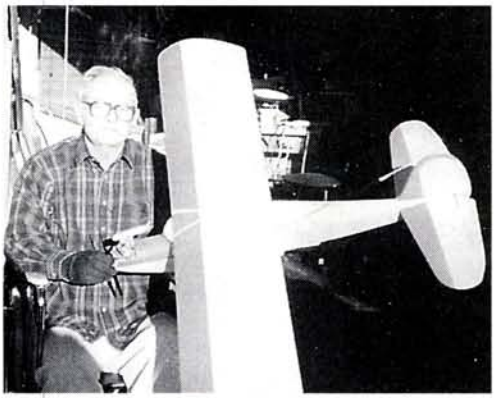
Modelers seem to have a soft spot in their hearts for the Live Wire Champion. Reports of that 44-year-old design seem continuous. Latest is from Bill Witaker of Oak Harbor, WA. Bill was modeling in the Army during WW II. He built and flew a CL Sportwing in Rabat, Morocco. Can you visualize the difficulty of finding needed bits and pieces in such a remote place in those times? Bill is now wheelchair-bound but anticipates that his expected recovery will allow the desired flights with his replica Champ.

BASEMENT BEGINNINGS

It was a welcome surprise to hear from Dick Smith, who left Rochester, NY, for Hemet, CA, about 16 years ago. In 1953, Dick was one of the founders of the Kodak R/C Club, which was born

Bill Witaker built and flew CL in Rabat, Morocco, while he served in the WW II army. One model was a dmeco Sportwing.

in Don Steeb's basement. How come good things come out of such unlikely places? When the Kodak Club expanded into the present Radio Control Club of Rochester, Dick did his part as newsletter editor for 23 years! It's great to see that Dick continues his contributions as secretary/newsletter editor for the Hemet Model Masters and as president of the Inland Empire Giant Flyers.



Bill Witaker of Oak Harbor, WA, looks forward to enjoying his replica LW Champ.

Should add that Ed Keck flew free flight with Dick and me in the old days, graduated into R/C pylon and was a national-level perennial pattern flyer. Now he's renowned as a member of the USA free-flight team—back to his beginning? Point is that Ed is also a founding member of the Rochester club.

Dick also reminisces about his most enjoyable flying experience in the United Pylon Racing Circuit (UPRC) of western New York and Canada. He reminded me that Don Steeb and he represented the Rochester club at the circuit's founding in my basement! The UPRC was (is) operated by five clubs in the area. Tales of exciting races would go on for pages.

In closing, I could say that your OT R/C place has rounded another pylon; perhaps you have something to add?

At an early United Pylon Racing Circuit sport pylon starting line, Dick Smith is ready for another exciting heat. Those are Orbit Reeds!

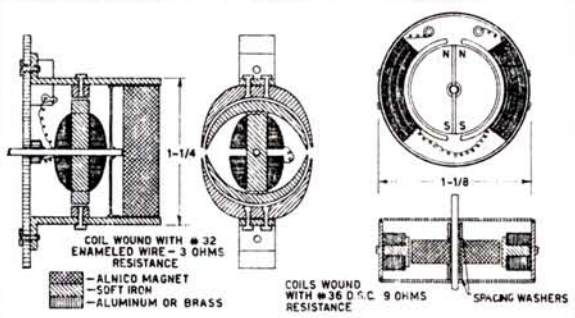
EARLY CONTRIBUTORS

In this day of R/C affluence, unless you were there, it can be difficult to comprehend what was required to fly R/C. There were no radios, no actuators, no hardware, no R/C engines, no R/C airplanes and no manufacturers. In effect, our pioneers had to start from scratch with everything! As you can imagine, such an effort required endless hours of work and much frustration. Modelers being cooperative, as most are, help came from unexpected people and the model press. Ed Lorenz in *Model Airplane News* and Howard McEntee in "Air Trails" featured monthly R/C info columns. In addition, when someone found an answer, he would provide a how-to article to one of the magazines. My memory suggests there were many how-to contributors.

Melvin Hall of Skippack, PA, reminds us that his good friend George Trammel of Gulfport, MS, was a prolific contributor. George was an electronic engineering instructor with the Air Force and an excellent modeler. He became involved in R/C during the postwar '40s and won second place behind the versatile Jim Walker at the '48 Nats.

Early R/C pioneer and Model Airplane News contributor George Trammel of Gulfport, MS, developed many pulse-rate innovations.

For the most part, these were single-channel carrier-wave days, which, at most, normally allowed rudder and engine via "bang-bang" escapements. There were dreams of multi and even proportional control, however. With single channel accomplished, the "basement innovators" were striving for more. With today's basic audio systems still a long way off, many were experimenting with ideas for single channel. In a seemingly lucrative method called "pulse," the single carrier wave was broadcast in segments that could be varied in length (both time on and time off) and later even amplitude. This offered multiple possibilities. All that was needed was a transmitter "pulser" that was capable of transmitting a desired code on the carrier wave, then an airborne system that could decode it into the proper control function.



Typical of Trammel inventions was this magnetic actuator for pulse proportional use. Its basic design became universal.

What may be surprising is that "pulse" offered proportional control long before any other method! But multi was still an "iffy" situation. Its accomplishment came via "slaved" actuators à la the compound escapements, in which a primary actuator activated a secondary actuator.

Considering his published works, it seems that George Trammel spent endless time searching for the most pulse had to offer. And, as did others like him, he helped us to progress further up the R/C ladder.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

EACH OF US has been brought into this hobby by someone who took the time to teach and nurture our love of aeromodeling. For me, a neighbor down the street, Joe Schmid, saw my 12-year-old jaw hit the ground while he loaded his '67 Volkswagen minibus with R/C gear. Joe knew my family, and he suggested that I ask my parents if I could go with him. I ran home, got permission, ran back and began helping him load. That afternoon, he let me fly his Proctor* Antic, and my affinity for model airplanes began.

It turns out that one of my favorite aspects of this hobby is helping the novice learn to fly, and I spend quite a bit of time on the flightline with new R/C pilots. I encourage them to build a trainer to maximize their appreciation of aeromodeling. Basic trainers (.40-size) I like to recommend include the Sig* Kadet Mk II, Carl Goldberg* Eagle II and the Great Planes* PT 40. Once the average pilot has mastered the basics of R/C flight, it's time for what I refer to as a "number two" aircraft: those aircraft that combine many of the favorable flying characteristics of the basic trainer in a more maneuverable aircraft, thereby giving the R/C pilot a greater challenge and more enjoyment.

by STAN KULESA

This past summer, my 13-year-old son, Jay, made that transition. He successfully completed our club's standardized flight test and mastered the fullest potential of his trainer. Jay doesn't have a lot of building experience. To simulate the building experience level of the average hobbyist completing a second or third model, I had him construct most of the Sig Four Star 60 while I supervised. This helped me "flush out" any shortcomings from the instruction booklet.

Sig Manufacturing FOUR STAR

PHOTOS BY STAN KULESA & GERRY YARNISH

Stan's son, Jay (left), poses with Dad and their Four Star 60.

SPECIFICATIONS

Name: Four Star 60

Manufacturer: Sig Mfg. Co. Inc.

Type: sport

Wingspan: 71 in.

Airfoil: symmetrical

Weight: 7.5 lb.

Wing area: 920 sq. in.

Wing loading: 18.75 oz./sq. ft.

Channels req'd: 4 (aileron, rudder, elevator, throttle)

Radio used: Airtronics* Vanguard FM

Engine req'd: .60 to .65 2-stroke, or .65 to .90 4-stroke

Engine used: O.S. Max 60 FP

List price: $110.95

Features: extensive prefabrication; laser-cut balsa and plywood parts; preshaped leading and trailing edges; precut ailerons,

A great "second" plane

FOUR STAR 60

elevators and rudder; formed aluminum main gear and formed tailwheel wire with nylon mounting bracket; molded, clear-plastic canopy; large decal sheets; engine mounts; all pushrods; Sig easy hinges; illustrated instruction manual.

Comments: the Four Star 60 is a great "number two" airplane for those looking to make the transition from basic trainer to that next level. The dihedral in the wing can be adjusted to your desired aerobatic needs. The model is quick to build and agile in the air.

Hits
- Superb-quality balsa and plywood.
- Laser-cut parts.
- Interlocking prefabricated parts ensured accurate construction.
- Great decal sheets.

Misses
- One precut aileron was warped.
- No illustrations for 2-stroke engine installation.

THE KIT

The kit was neatly packaged. There were no surprises in the quality of balsa and plywood; it's typical Sig excellent-quality stock. All balsa and light plywood sheets are laser-cut. Some smaller wooden parts (blocks, dowels, etc.) and the hardware were wrapped in plastic bags. The two sheets of blueprints were folded; one was primarily for the wing and the other for the fuselage. The instruction booklet is well written; it contains step-by-step photographs and is very informative. Along with providing construction details, the booklet covers other pertinent issues, such as when to use certain glues, covering the model, tools needed, etc. As such, it is user-friendly for those with limited building experience.

CONSTRUCTION

• **Wing**. Construction begins here. Sig took wing-construction design very seriously. There are 10 spars (when you include the doubled main top and bottom spars), webbing for the main and secondary spars, diagonal wing bracing, leading edge (LE), trailing edge (TE) and sheeting over the center section and trailing edge. When designing this wing, it seems as if Sig scaled down its Four Star 120 instead of scaling up its Four Star 40.

An O.S. Max 60 FP provides plenty of power.

Jay Kulesa finish-sands the completed wing. Construction is light and strong.

Once you pin down the bottom main spars, webbing is glued in. Once the webbing is tacked down, the ribs and diagonal bracing are added. This is where the quality of laser cutting really shows! Everything pieced together very nicely due to the interlocking assembly.

The dihedral brace should be epoxied in. While I was tempted to "zero-out" the dihedral to enhance aerobatic performance, I decided to stick with the recommended dihedral since my son will use this as his "number two" airplane. I used Tower Hobbies* 6-minute epoxy for this and thin CA for all other construction on the wing. I also used thin CA on the nylon tape for wing joining.

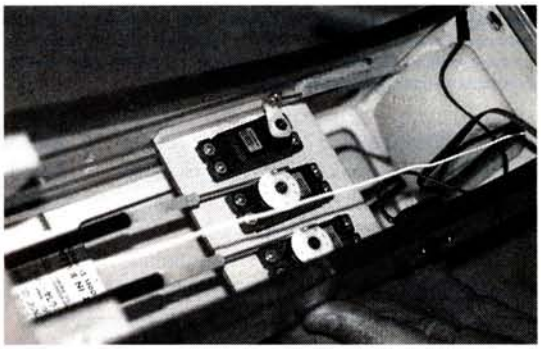
Pre-cut 3/8-inch balsa ailerons are provided. The TE is rounded and the LE comes to a point to minimize the aileron gap and maximize up and down movement.

• **Fuselage**. As with the wing, fuselage construction is made easy by the interlocking parts, which also contribute to perfect alignment. Each fuselage side comes in two parts that fit very nicely together. Because of a good sanding job, the joint didn't appear through the covering. Plywood doublers inside add strength to the joint. Under the tank compartment is a place for the airborne battery and receiver. I routed my antenna through the bottom of the fuselage behind the wing. I used Du-Bro* wing-saddle tape. The turtle deck is all-balsa construction. I used Tower Hobbies 6-minute epoxy to glue the firewall, landing-gear plate and wing hold-down blocks. Otherwise, I used thin CA for all balsa and medium CA for all plywood. The main landing gear is one-piece aluminum. I replaced the suggested 6-32x1½-inch screws meant for axles with Carl Goldberg axles. I used Du-Bro 3¼-inch wheels.

• **Empennage**. As with the wing construction, the stabilizer and fin have interlocking parts. Both the LE and TE are grooved to allow for the ¼x⅜-inch stringer material. For added strength, the stabilizer and fin are covered with 1/16-inch balsa sheeting. The elevator and rudder are laser-cut ⅜-inch balsa. The elevator halves are connected by a formed ⅛-inch elevator joiner wire. The bottom of the rudder needs to be grooved to fit the tailwheel wire. The instructions call for wrapping nylon tape around the bottom of the rudder to add strength to support the tailwheel wire mounting. Instead of building up the fairing between the fin and elevator, I used a ¼x¼x2½-inch piece of balsa and sanded it to shape.

• **Radio and engine**. There's a lot of room to work with in this model. Sig provides a plywood servo-mounting tray for the elevator, rudder and throttle servos and also provides nylon-in-nylon pushrods for the empennage controls. Each of the fuselage formers behind the wing have pre-drilled holes/guides through which the outside nylon tubes are glued. The inside nylon tubes fit snugly inside the outside tubes. Exits at the rear of the fuselage have also been pre-drilled.

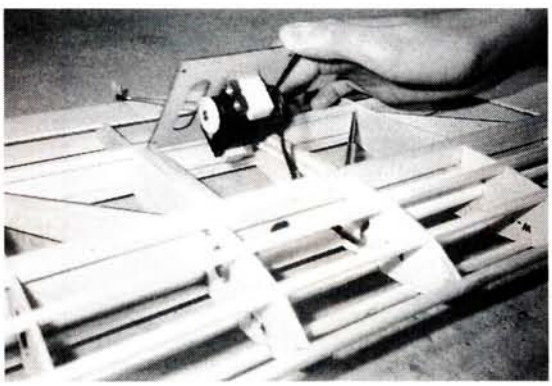
The instruction booklet calls for the clevises to be soldered at the radio end of the pushrods. I replaced the clevises with Z-bends (old habits die hard). Depending upon your control-surface sensitivity needs, larger horns are provided for the empennage to allow greater adjustment. All this hardware is included in the kit.



Radio installation is pretty basic. A plywood servo tray and nylon pushrods to the rudder and elevator are provided.

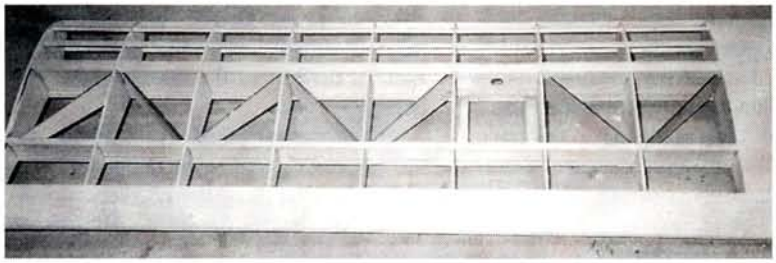
Throttle linkage is a steel cable inside a nylon tube. Since I used a 2-cycle engine, the tube went through the firewall just above the engine mount. I added a piece of scrap balsa to support the nylon tube at the radio end of the pushrod.

The model calls for two aileron servos—one mounted on each wing. Servo mounting is done on the back of the access hatch. Exit holes have already been laser-cut into these hatch covers. Despite mounting the servo where instructed, I found that I still had to shave some of the exit holes. The servo wire goes through a precut hole in the webbing and is snaked through a paper tube to the center of the wing. You will need at least a 6-inch servo extension and a Y-harness to complete aileron installation.

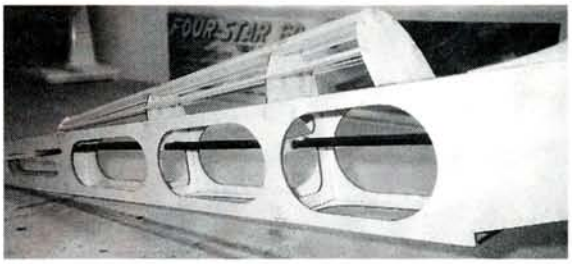


Each aileron has a dedicated servo. For easy access, the servo mounting is done on the back of the plywood hatch. To complete the aileron installation, you'll need two 6-inch servo extensions and a Y-harness.

Engine installation was downright simple. Sig provides a two-piece nylon mount. There is no side thrust, and the downthrust is built into the fuselage sides where the firewall fits, so there's no need to measure. I used an O.S.* Max 60 FP with a Hobbico* deflector at the end of the muffler. I used Carl Goldberg 6-32 hex screws to secure the engine to the mounts and to connect the mounts to the firewall. The engine is swinging an 11x6 Master Airscrew* prop and a 2½-inch black Great Planes spinner. There are no illustrations for 2-cycle engine installation (which is a shame because there's plenty of room on the blue-



Sig took wing-construction design very seriously. There are 10 spars (when you include the doubled main top and bottom spars), webbing for the main and secondary spars, diagonal wing bracing, leading and trailing edges and sheeting over the center section and trailing edge.



This is a good view of the rear of the fuselage and turtle deck. Lightening holes have been laser-cut into the light plywood frame. Guide holes and exits for the nylon pushrods provided in the kit have been pre-drilled in each of the formers.

prints). When tapping holes in the mount, make certain you measure for spinner clearance. I had to notch the fuselage sides to fit the muffler and needle valve.

I used a Du-Bro 12-ounce fuel tank. A hole is already drilled in the firewall to provide for the fuel tubing. I coated the engine compartment with Tower Hobbies 6-minute epoxy. I try to get a small lip of epoxy over the covering to seal these edges and minimize fuel seepage. There is a hole in the bottom of the fuselage under the engine compartment that serves as an oil drain as well as a convenient place to route the vent line from the fuel tank and/or breather line from the crankcase of a 4-stroke engine.

FINISHING

Sanding the model in preparation for covering was pretty easy since much of the construction is interlocking. The instruction booklet goes into quite a bit of detail about covering with assorted fabrics and finishes. We decided to use Top Flite* MonoKote and ended up using about 2½ rolls of orange. Whenever possible, I try to avoid seams. Therefore, I covered each wing and stabilizer half with one sheet of MonoKote. I began by covering the wingtips, then I sealed the bottom TE, then pulled the fabric around the LE and sealed the top TE. I then used my Top Flite heat gun to shrink the fabric and my iron to get the ribs, spars and LE to adhere. Since I used a 2-cycle engine, my muffler exhausts on the right side of the fuselage. I used one sheet of MonoKote to cover the right side, turtle deck and fuselage front, top and bottom. Another sheet of MonoKote was used to cover the left side of the fuselage.

I used a Top Flite Hot Sock over the iron to minimize scratching. When I finished covering, I removed the sock and used the iron to go over all seams to ensure the best possible seal.

As suggested by the blueprints, we painted the cockpit floor black and installed a 2⅝-inch Williams Bros.* pilot. The clear-plastic canopy provided in the kit was next to go on. I used thin CA to join it to the fuselage. Because of the turtle deck, there is no means of adhering the rear of the canopy to the fuselage. We used Carl Goldberg ¼-inch black pinstriping around the canopy. The kit comes with decal sheets that nicely dress up the model.

CONCLUSION

Sig has put together yet another winner. The instruction booklet was well-laid-out and the narrative and pictures made it easy to follow. The Four Star 60 was easy and fun to build. I was most impressed with the speed of construction, as we had this plane ready to fly in about two weeks.

Overall, it was a positive experience for Jay. The quality of materials and ease of construction added to that opinion. As with the basic trainers, I have several "number two" aircraft I like to recommend. In light of its building and flying characteristics, I have now confidently added the Sig Four Star 60 to that list.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

FLIGHT PERFORMANCE

• Takeoff and landing

The Four Star 60 required no rudder input during takeoff. I simply throttled up and it tracked straight as an arrow. At ½ throttle, the tail comes up. At full throttle (with a little up-elevator) the main gear comes off the ground. If you fly from a short runway, going to full throttle with a little up-elevator gets the plane off the ground in 20 feet or less.

As with the takeoff, I fed in a little up-elevator, and the ascent was straight and solid. Once airborne, my trim adjustments included just a little up-elevator and left aileron to achieve straight-and-level flight.

We had several landings, some with engine and some dead-stick. At ¼ throttle, the plane settles nicely. This is particularly useful if your flying site has a short runway, as it's a simple matter of lining up with the end of the runway and letting gravity do its job. The dead-stick landings were equally gentle. Length of glide was average but adequate.

• Low-speed performance

To maintain straight-and-level flight at low speed, I flew at ¼ throttle and added very little up-elevator. Consistently, the Four Star 60 tracked very well going wherever it was pointed. Stalling characteristics are somewhat reminiscent of a basic trainer.

• High-speed performance

During high-speed flight, the plane continues to track straight and solid. Rolls were right on the axis, loops were large and round and stall turns were precise. The Four Star 60 can move quite quickly when the throttle is opened, and its large speed range facilitates a new pilot's transition from basic trainer to "number two" aircraft and a wide spectrum of flight capability.

• Aerobatics

The Four Star 60 is very responsive to the controls. Like most constant-chord aircraft, rolls are not completely axial, but they are quick and controlled. Loops are pleasing, as the plane tracks through them with little right rudder required. A snap at the top and respectable avalanches can be done. Inverted flight does require some down-elevator, but the plane is quite stable in that attitude. The Four Star 60 does super stall turns.

Overall, I found the Four Star 60 to be a very pleasing model to fly. As the pilot's skill and comfort levels increase, the Four Star 60 will respond accordingly.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

Nick Ziroli Plans Stearman

by GERRY YARRISH

IN EVERY modeler's head there seems to be at least one aircraft with two wings and a round engine floating around—a favorite biplane there is no reason to build other than that the modeler thinks it's just "plane" cool. For me, it's the Stearman PT-17 or the Navy variant the N2S. The Stearman is a wonderful model subject because of the many colorful paint schemes to chose from—both military and civilian. The paint scheme on my N2S came from a 1995 EAA aviation calendar I bought at a local book store.

NICK'S STEARMAN

The PT-17/N2S designed by Nick Ziroli Sr. is a very popular design and can be found at many giant-scale model meets. I built mine from a discontinued Aeroplane Works kit, but kits are currently available from Madden Models*. You have to buy the plans from Nick Ziroli Plans*. The Stearman is not difficult to build, but it's not for a beginner. Here's what I found while building mine.

FUSELAGE

I started construction with the fuselage and began by building the horizontal fuselage crutch shown on the plans. The crutch is made of ¼x½-inch balsa and extends from the firewall to the tail post. A lite-ply box structure is built and attached to the crutch. The box forms the foundation of the wing saddle and supports the wire cabane struts. The horizontal stab sits on a lite-ply cradle that is glued to the aft portion of the crutch. I found it useful to build a 6-inch-high building jig to hold the crutch up off of the workbench.

The jig holds the crutch straight as each of the lite-ply formers is attached. Supports are positioned so they won't interfere with any of the formers. The forward formers are each made in four pieces, and installing these requires the removal of the fuselage from the jig. Remove the fuselage and turn it upside-down on the supports to install the multi-piece formers. The next step is to install the fuselage stringers.

To finish off the Stearman, I added scale windshield, cockpit padding and a pair of Midwest ready-made Stearman instrument panels.

The ⅛x⅜-inch balsa stringers fit

The Stearman N2S was the Navy version of the Army's primary trainer. I chose the Navy version to be a little different.

PHOTOS BY WALTER SIEVERS & GERRY YARRISH

An IMAA-legal sport-scale warbird trainer

SPECIFICATIONS

Model name: Stearman PT-17 / N2S

Designed by: Nick Ziroli Plans

Type: sport-scale biplane

Length: 59 in.

Wingspans: 77 in. (top), 72 in. (bottom)

Wing area: 1,725 sq. in.

Weight: 18 lb.

Wing loading: 24.04 oz./sq. ft.

Airfoil: semisymmetrical

Radio req'd: 4-channel (rudder, aileron, rudder and throttle)

Radio used: JR XP8103

Engine req'd: 2 to 3ci

Engine used: Quadra Q-52XL w/IntelliSpark ignition

List price: Ziroli Plans, $ 34; Gary Madden kit, $325

Features: the plans are of three full-size sheets that include a template sheet showing all the individual parts. The plans show both a wire landing gear as well as the construction details for installing Robart Oleo struts. Wing and tail incidence as well as CG are clearly labeled.

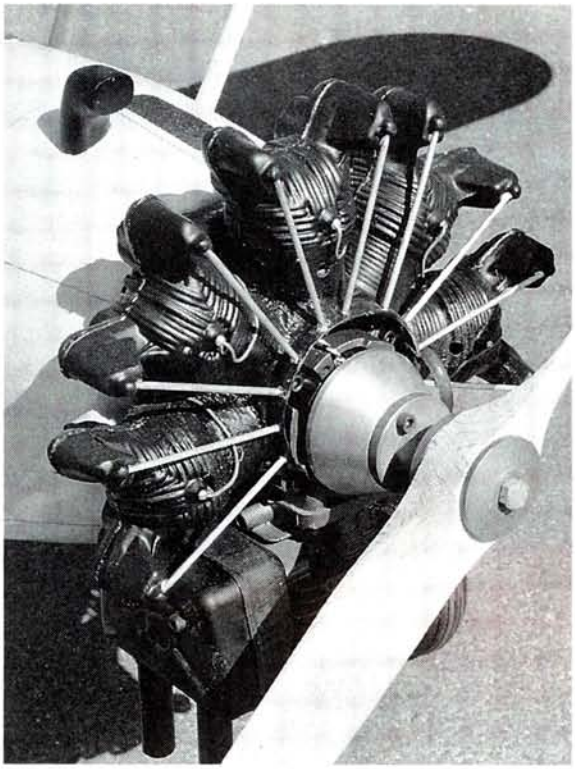
Comments: typically, kits cut from Ziroli plans are of very good quality and include all the wood required to complete the model. Balsa stringer stock is included as well as aircraft-grade plywood parts and lite-ply formers bandsaw cut and sanded to size. The old Aeroplane Works kit matched the plans precisely, and the same can be said for the new Gary Madden kits.

Hits

- Excellent flight performance.
- Well-designed construction.
- Relatively easy to build and set up.

Misses

- No hardware.



The Stearman looks so much better with a dummy radial cowl added; this one (five cylinders of one anyway), is from Bob Dively Models.

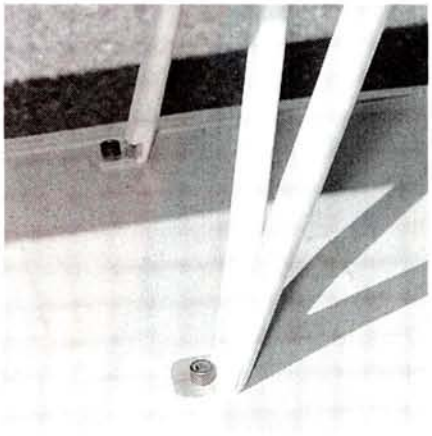
precisely into slots that have already been cut in the formers. It is also a blessing that the slots are all perfectly aligned. When installing the stringers, glue in a couple at a time and alternate from one side of the fuselage to the other. This way, you distribute the bending forces of the stringers evenly, and you get a straight fuselage. With most of the stringers in place, the fuselage can be remove from the building jig.

Before planking the fuselage with balsa, the landing-gear support bulkheads and the four cabane wire support blocks have to be epoxied into place. For landing gear, you can use either bent music wire legs or a set of Robart* custom-made Oleo struts. Both installations are shown on the plans. I installed the Robart struts and the required plywood bulkheads. These plywood parts must be bolted to the struts before they can be epoxied into place. The struts are then covered with balsa blocks to form the landing-gear fairings, and I made the gear-to-fuselage fillets with a mixture of microballoons and polyester resin. The tailwheel is attached to the aft fuselage former with a CGM* nosewheel bracket. (This is done before the tail filler blocks are glued into place.) Since the fuselage can't be finished without the tail parts or the wings, let's change channels for a moment.

THE WINGS

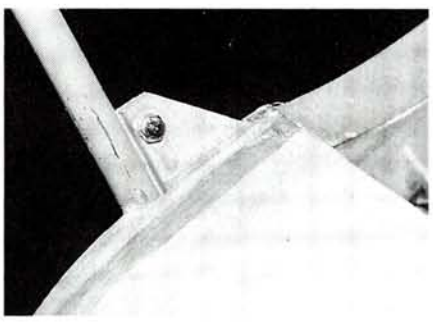
The wings are strong D-tube structures with the leading and trailing edges sheeted with 3/32-inch balsa. The main spars use vertical-grain shear webbing and the wingtip bows are laminated lite-ply and balsa. Both wings are built over the plans using a 1/4-inch-square jig stick to hold the rib trailing edges up off the plans. The position of the jig stick is shown on the plans. The center section of the top wing has lite-ply ribs to support the hardwood cabane attachment blocks. It is much easier to drill the holes for the 8-32 blind nuts in the hardwood support blocks before you glue them into place. Position the blocks over the top view of the wing, and mark the positions of the holes. Install the blind nuts and place the blocks in the slots in the wing ribs. Position the mount blocks carefully before the epoxy cures.

The hardest part of the wing construction is getting the LE sheeting to blend smoothly into the wingtip bow outboard of the last wing rib. A fair amount of wetting, bending and clamping is required. I found that slitting the balsa spanwise and removing a long wedge shaped piece helped allow the sheeting to form the required compound curve. I used Sig* Bond on all the wing sheeting.



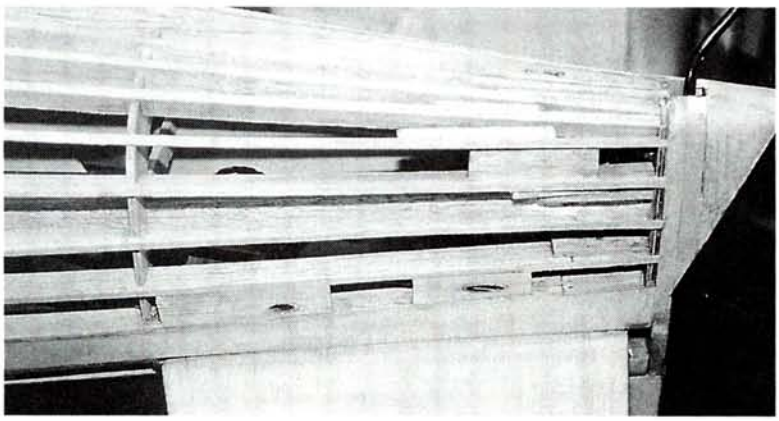
The interplane struts are made of spruce and attached to the wings with aluminum L-brackets and 4-40 cap-head screws. Field setup time is less than 10 minutes.

The top wing is built in one piece and has no dihedral. The bottom wing is built in two panels, joined in the center and reinforced with plywood dihedral braces. The ailerons are formed by cutting them out of the built wing and then adding their LEs. The plans show top hinging for the ailerons and I used Du-Bro* giant-scale hinges with removable cotter pins. This was the first time I had used Pacer Technology* Hinge Glue, and I found it works very well. I did add a small drop of fine machine oil to the hinge pins to prevent them from binding with glue.

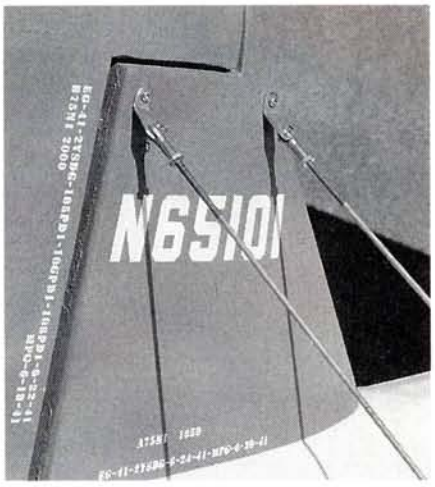


This is what the landing gear coming out of the fuselage looks like after planking the belly-pan area. The plywood support is epoxied into place between support bulkheads.

A 1/2-inch diameter dowel holds the LE of the bottom wing secure while two 1/4-20 nylon wing bolts are used at the TE. Before you add the wing's top center-section sheeting, be sure to install the filler block material where the wing-mounting-bolt holes will be drilled. Once both wings



Here you can see the stringers and the small sheet fillers between them for the pushrod exits.



The double tail wires are made of 2-56 threaded rods and Nelson Aircraft scale clevises; the small attachment brackets are made of steel; landing-gear attachment straps from Du-Bro.

had been built and final-sanded, I filled dents and dings with filler and set them aside for covering.

TAIL FEATHERS

The horizontal stab and elevators are of built-up construction and assembled over the plans. The vertical fin and rudder, however, have thick airfoil cross-sections and are built off the plans. The rudder's LE is made of two 1/4-inch-thick balsa strips glued together to form a shallow "V" shape. The 3/32-inch ribs are glued to the LE, and then the TE and top and bottom blocks are added to give the rudder its final shape. The vertical fin is fully sheeted with 3/32-inch balsa sheeting. I used Robart Hinge Points in the tail, and I added filler blocks to all the hinge locations. I also added balsa filler blocks at all the points where the tail wires were to be added.

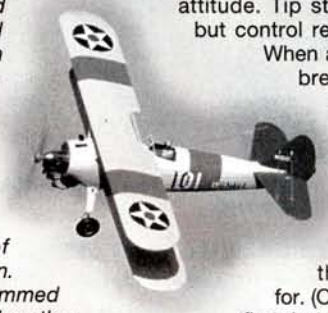
BACK TO THE FUSELAGE

Glue the horizontal stab into place, followed by the tail filler block and the vertical fin. The plans show that the aft cabane-strut wires are slightly longer than the front ones, so don't mix them up. The side view shows the locations of the holes to be drilled in the box structure for the bottoms of the cabane wires. Attach the cabanes to the top wing, and slide the strut wires into the grooved support blocks. Insert the ends of the cabanes into the holes and epoxy the blocks into place, trapping the vertical section of the cabane against the side of the fuselage box. Clamp the blocks into place, and check the top wing's incidence and squareness to the fuselage centerline. With the fuselage's tail blocked up to show a +2 degrees horizontal-stab incidence, the top wing should have 1 1/2 degrees of positive incidence. When you have the wing properly positioned, tighten the clamps holding the grooved cabane-

The cabanes are made of music wire, and spruce fairings were added for a better appearance.

FLIGHT PERFORMANCE

The first flight of the Stearman should have been on the TV show "How'd they do that?" The model was finished the day before the 1996 Warbirds over Delaware meet and I worked all through the previous night to get it ready. Tropical storm Bertha had blown into town, and the wind was gusty and strong. Test pilot John Kohler agreed to brave the winds and we went for it. As it turned out, the model was very tail heavy and required full down trim to fly close to level. After a dicey landing. I added 8 ounces of lead and we were off again. Properly balanced and trimmed and with winds measuring less than 15mph, the big bipe showed it was a tame and respectable performer.



• Takeoff and landing

The Q-52XL produces a lot of torque, so rudder is needed to counter the swing to the left. Applying throttle gradually and slowly keeps things in check and the model breaks ground with a slight pull of up-elevator. Landings require you to keep the power on until it's time to flare. Keep the nose down and adjust power for a smooth, shallow decent.

• High-speed performance

I don't fly the Stearman at high speeds; it wasn't designed for that. I fly at about 1/2 to 3/4 throttle most of the time. On takeoff, the model leaves the ground at slightly less than 1/2 throttle. As speed increases, so does the amount of down-trim you need to dial in. Coming out of steep dives is as fast as the model gets, and it doesn't do anything unusual. Control is crisp and but not overly sensitive.

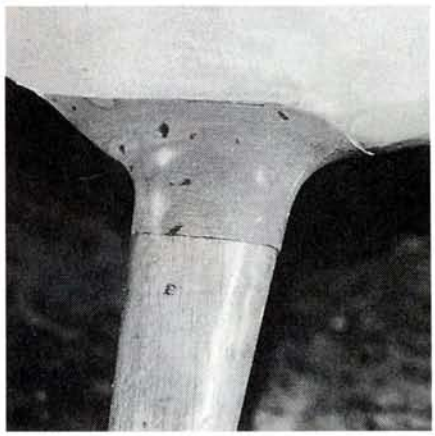
• Low-speed performance

Low speed, like trying to stretch a landing, should be avoided. Like any other large bipe, the Stearman has a lot of drag and will lose speed quickly. Coming in for landings or touch-and-go's, I keep the throttle at about 1/4 and maintain a level or slightly nose-down attitude. Tip stalls are not a problem, but control response begins to slow. When asked to stall, the model breaks straight ahead and requires both increased power and release of up-elevator to start flying again.

• Aerobatics

Barnstorming is what the Stearman was born for. (OK! It was a military trainer first, but give me a break.) With a Q-52XL bolted to the nose, the Stearman has gobs of extra power. Loops are big and round and I chop power on the back side to prevent the speed from building up. Rolls are crisp and a small amount of rudder speeds the roll rate. Inverted flight requires a good amount of down-elevator, but it does handle very nicely with the wheels in the "up position." The way I have the model set up, knife-edge is not a pretty thing—more like an on-its-side descent; there just isn't enough rudder throw. But, then again, we're not talking about a Pitts or an Ultimate. Spins are very pretty but, to recover, will require about half a rotation after the controls have been released .

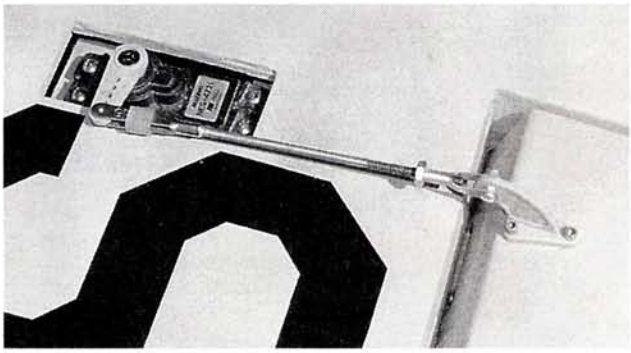
The Stearman does everything I want it to, and it does it in a very scale-like manner—just the way I like it.



Here, the landing gear fairing blocks have been carved to shape and covered with fiberglass cloth. The fillet at the top of the gear is made of microballoons and resin (much sanding required).

mount blocks, and let the epoxy cure completely before removing the clamps. When you install the bottom wing, it should be set at zero degrees.

Once the cabanes have been permanently installed, you can finish planking the fuselage. Planking is easy, except where the front of the fuselage just aft of the firewall bends sharply. Use small sections of planking there, and use wedge-shaped pieces of balsa to fill the gaps between the planks. After the fuselage has been planked and sanded smooth, the thick plywood firewall can be added. It is best to drill holes and install the blind nuts for the engine-mount bolts before gluing the firewall into place. Before covering the model, install the rudder and elevator pushrods. I used Sullivan* flexible pushrods for this, but with an important modification: I ran a 1/16-inch-diameter welding rod through the yellow inner sleeve and soldered 4-40 threaded pushrods to the ends. This strengthens the pushrod greatly and eliminates any chance of it expanding or contracting. I also supported the outer sleeves every 4 to 6 inches.



The aileron servo is mounted in the wing panel just forward of the aileron; 4-40 hardware is used throughout.

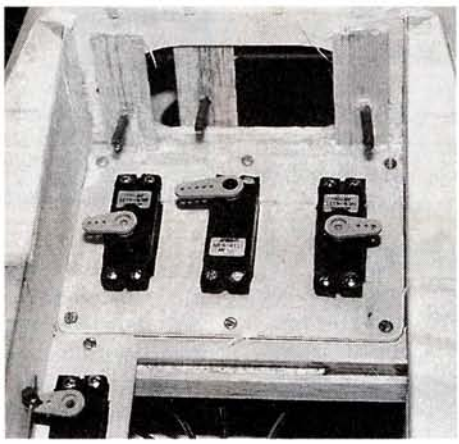
Throttle and fuel tubing installation is straightforward and out in the open for easy access.

COVERING AND FINAL ASSEMBLY

I covered and painted the Stearman using F&M Enterprises* Scale Stits fabric and paint. (see *Model Airplane News,* October '96). Scale Stits is the same material as used on full-size aircraft, and the paints match FS numbers precisely. I dressed up the Stearman by adding rib stitching, panel lines and rivet details. The star roundels and the "U.S. Navy" markings on the bottom wing come from Model Graphics*.

The N-struts are made of spruce and are attached to the wings with 4-40 cap-head screws and aluminum L-angle brackets. When assembling and installing the N-struts, be sure to keep the distances between the top and bottom wingtips equal and re-check the wing incidence.

Final assembly includes installing the control horns and making up the pushrods. I used Robart ball-link control horns and clevises and Du-Bro giant-scale servo arms. I also used scale clevises from Nelson Aircraft* to attach the tail wires—very nice.

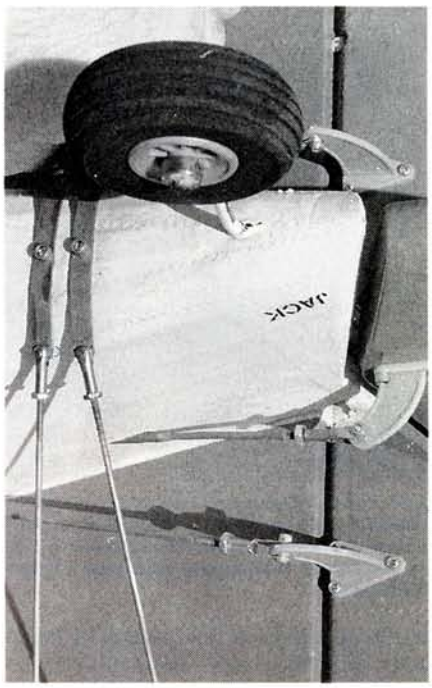


Radio installation is simple and easy to get to with the bottom wing removed.

ENGINE AND RADIO

For power, I chose the Quadra* Q-52XL with the Intellispark electronic-ignition system. A hand-held controller input device can be plugged into the Intellispark; it allows you to adjust the engine's timing while it is running. Also, you can retrieve the max rpm reading from your last flight—a convenient way of testing props.

I am currently flying the Stearman with a JR* XP8103 computer radio with a combination of NES-4721 and NES-4135 servos. I use one servo for each elevator half and one for each aileron. A standard NES-517 servo controls the throttle. I use a 1400mAh battery pack for the RX and a 1000mAh battery pack to power the ignition system. Both switches are in the front cockpit.



The tail feathers are moved with Robart ball-link control horns. Note the tailwheel position and the tail-wire attachment detail.

For final detailing I installed a pair of Midwest* ready-made Stearman instrument panels and a vacuum-formed Bob Dively* dummy radial engine. To hold the dummy engine in place, I simply glued it to the Quadra and the firewall with Innovative Model Products* PFM adhesive. After many flights, the dummy engine is still in place.

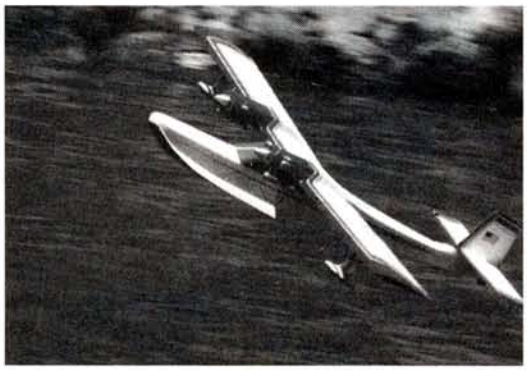
The Ziroli Stearman is a wonderful biplane to build and fly, and I recommend it to anyone who has built a few large models. Though hardware and instructions are not included in the kit, this IMAA-legal biplane goes together relatively quickly without much fuss or confusion. Enjoy!

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.* ✦

FLOAT FLYING for

by GEORGE WILSON JR.

12 setup tips for success



This twin-powered model has just broken free of the water and is heading out for another flight. Note the prominent strake on the bottom of the foward fuselage area.

LIKE OUR HOBBY, "functional" R/C seaplanes have progressed from the primitive to the sophisticated. (Note the emphasis given to the word functional). By this, I mean seaplanes designed to work well and, usually, not scale designs. Initially, they were intuitive copies of their full-scale counterparts; today, they are a breed by themselves. The designs have become simpler and similar as their designers have recognized the simple rules that govern good model-seaplane performance.

Seaplane popularity has grown as people have found that they are easily built and flown. To some degree, seaplane sites are more easily found and maintained than land plane sites. Those who learned to fly using seaplanes recognized early on the advantages of being able to take off and land directly into the wind. Water is forgiving; it's much softer than grass or hardtop. And an error of landing location by 100 feet from where it was intended is known

This 1/4-scale clipped-wing Cub is right at home on the water. Note the addition of the sub-fin under the tail of the model. This helps stability by offsetting the drag produced by the floats while in flight.

Fun

only to the pilot. Contrast this to a disastrous landing in what is known on Cape Cod as the "pucker brush."

TYPES OF SEAPLANES

Seaplanes are clearly divided into floatplanes and flying boats. The former results from adding floats (sometimes, a single float) to a land plane. This approach allows R/C trainers and sport planes to serve both as land planes and seaplanes. The design rules for both types of seaplanes are the same. For best results, the floats on a floatplane should be mounted rigidly. Aside from having to build and mount two floats, a major concern is minimizing the amount of power-robbing water that is sprayed into the propeller.

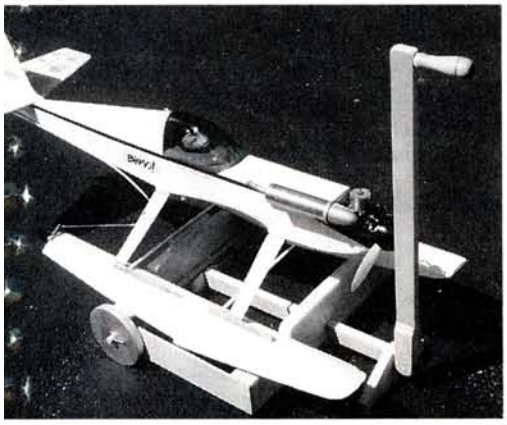
Single-engine floatplanes typically send the spray outward and away from the propeller. For this reason, wide hulls are also recommended. To deflect spray away from the hull or fuselage, floats or hulls should have sharp chine edges or spray rails. Andy Lennon's float-bottom design (November '96 *Model Airplane News*) is a so-called "viper" bottom that neatly handles this problem.

The flying boat is the obvious choice if you want to build a seaplane. Many are kitted and many scratch designs are available. These airplanes have many advantages and a couple of disadvantages. First, a high horizontal stabilizer is preferred to keep it out of the spray and more centered in the propwash. This causes some concern about routing the elevator control linkage. Second, the engine must be mounted above the wing center to give it best protection from the water. This makes the throttle control servo/linkage/cable somewhat complicated.

Here, I'm preparing the Seacat for flight (circa 1959). Note the long tail moment.

MODEL VS. FULL-SCALE

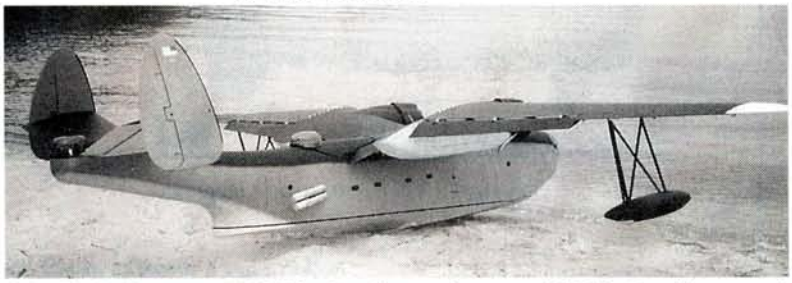
An interesting aspect of seaplane design is that water is not as compressible as air. Air compressibility makes it necessary to



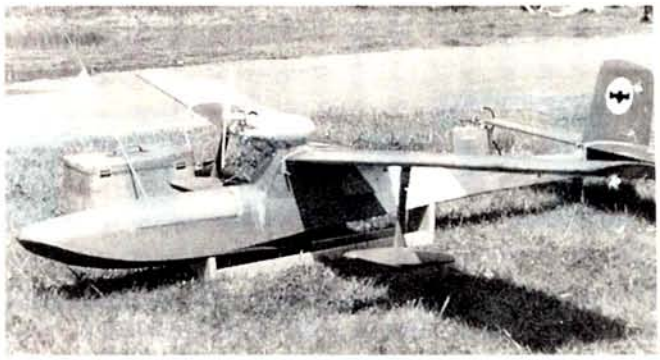
If scratch-building from plans is not your bag, excellent seaplanes can be built from kits. Here is an Ace R/C* Bingo .40 converted to a floatplane using Kircher R/C Products* 31FK floats. Note the water rudder and its linkage that ties to the air rudder. Also note the "mobile cradle" that protects the floats when they are on land and makes transportation easy.

The Seapprentice (June '69 Model Airplane News) was my floatplane version of Bill Northrop's Apprentice (Model Airplane News plan no. FSP05683). It was an initial step in the development of functional seaplane floats. This 1967 model is still flyable.

This Citabria is riding high and on the step. Properly set up floats allow the model to rotate at takeoff to achieve the proper angle of attack.



John Nicolaci's veteran PBM flying boat has a wingspan of 11.5 feet and is powered by two SuperTigre* .71 engines. This model has flown for many years and has many features, such as a bomb drop and functional JATO tubes. Though not necessary for takeoff, they do make for spectacular takeoffs. Construction is mostly of foam.



Left: Fred Tuxworth's fabulous amphibian Loening flying boat has a 9-foot wingspan, weighs 40 pounds and uses a Zenoah* G-62 engine. After landing on the water, it taxies up to the beach, lowers its landing gear and climbs out of the water—awesome! Right: the Custom Privateer—a 9-foot-span early design by Don McGovern. Often referred to as "McGovern's Monster," many were built and flown. This one was Wes Army's example. Note the long hull that was supported by a large, high-lift wing.

redesign the airfoils used for models. The design equations involve Reynolds numbers that vary with speed and air density. The design equations for seaplane hulls, water rudders, etc., involve the Froid number, which is a constant. The bottom line is that the water aspects of model seaplanes can be modeled directly from their full-size counterparts.

HULL DESIGN

In the early days of seaplanes, long hulls were popular. Typically, the NACA long, planing hull was used. These hulls worked well with high-lift airfoils that needed little rotation to provide the lift required for takeoff. I learned to fly using one of these: Henry Struck's Seacat, which was originally intended to be a free-flight model. Another example is Don McGovern's 9-foot Custom Privateer, sometimes called "McGovern's Monster" because it was very large for the 1950s. These models flew slowly—majestically—and took off the same way.

Modern hulls and floats are more scale-like and function more like full-scale airplanes do. Their float/hull steps allow the model to rotate about the tip of the step and achieve lift for takeoff at relatively slow speed.

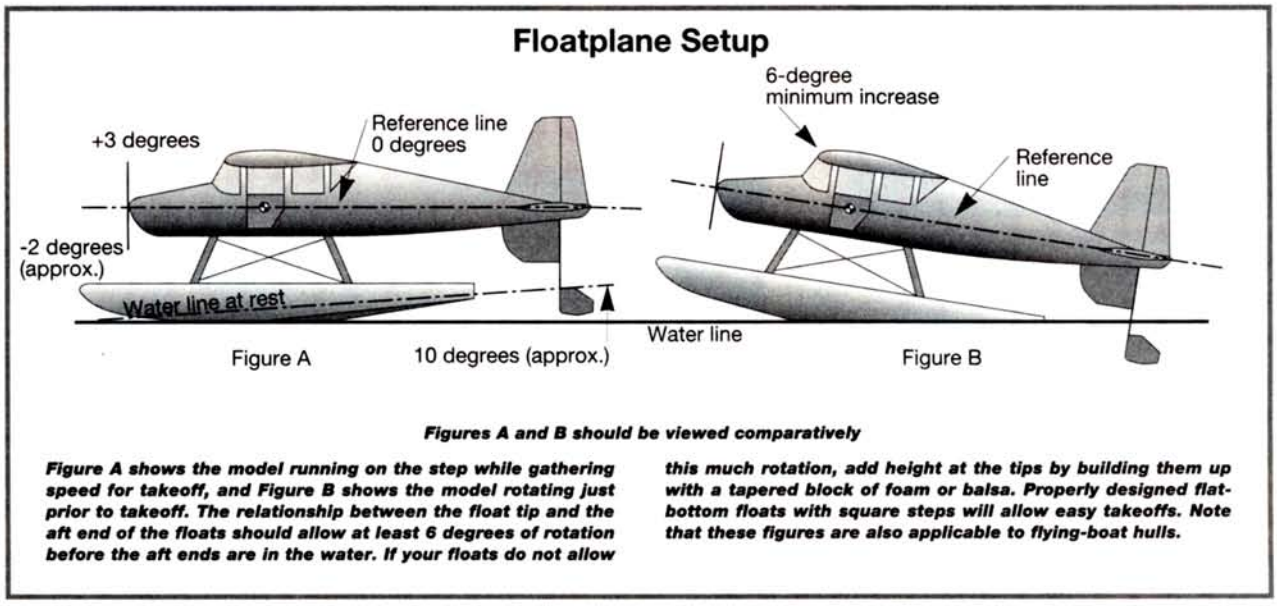
Q&A

The questions and answers that follow address the most frequently asked questions I have encountered. Bear in mind that seaplanes (and land planes) will function well even when they stray widely from the "cookbook" rules. John Ross used to say, "If it looks like it will fly it most probably will." Most of the answers below apply equally to floatplanes and flying boats.

Q. ***Can I fly off salt water?***
A. Yes, but it is not recommended unless you corrosion-proof or eliminate all exposed metal. My Seacat required many hours of refurbishing after one season of saltwater flying.

Q. ***How big should the floats be?***
A. At least as long as 80 percent of the fuselage and with enough volume to float the model with ease. The front of the float should project in front of the propeller by as much as ½ the propeller diameter to help avoid forward tip-overs during steep landings.

Q. ***How should floats be mounted?***



Figures A and B should be viewed comparatively

Figure A shows the model running on the step while gathering speed for takeoff, and Figure B shows the model rotating just prior to takeoff. The relationship between the float tip and the aft end of the floats should allow at least 6 degrees of rotation before the aft ends are in the water. If your floats do not allow this much rotation, add height at the tips by building them up with a tapered block of foam or balsa. Properly designed flat-bottom floats with square steps will allow easy takeoffs. Note that these figures are also applicable to flying-boat hulls.

Another great way to get into float flying is with the tried and true Lanier RC* Seabird ARF. The pylon engine mount design keeps the prop away from the water.

A. As rigidly as is practical. N- or X-bracing lengthwise and float-to-float bracing will stiffen up the mount installation. Hard mounting conserves energy and helps get the model up on the step easily. Unless your floats are to be dedicated to one model, build them with mounting rails along their tops to allow proper fore and aft positioning.

Q. ***How tight must the waterproofing be?***
A. Enough to keep water from the electronics. In a well-made seaplane, the fuselage (hull) is sealed to prevent water entrance. Early receivers and servos were sometimes wrapped in plastic bags, but this was not adequate for serious water flying. On the other hand, an inch or so of coaxial control cable will discourage water from entering via the control exits. If the radio components get wet with fresh water, dry them as soon as practical by opening their cases and blotting out the water. Further drying in the sun or with a heat gun will make them as good as new. Salt water must be flushed out with fresh water as soon as possible and then the equipment must be dried. The use of an anti-corrosion spray (typically, Corrosion-X or WD-40) is recommended.

Q. ***At what angle should the floats be set?***
A. Ideally, the floats should be at an angle that causes minimum drag in flight—normally, a little negative with respect to the reference line through the (non-lifting) horizontal stabilizer. This angle is not an appreciable factor in "getting the airplane on the step."

Q. ***How large should the step be?***
A. The size of the step is not important. The height of the float at the step is most important. To achieve maximum lift at low speeds, the wing's angle of attack should be 6 degrees or more. This means that when running on the step, the model must be able to rotate its nose upward at least 6 degrees before the aft end of the float touches the water. (See Figures A and B.)

Q. ***What is the proper location of the step?***
A. The step should be directly under the model's center of gravity (CG); however, this is not critical. If the step is in front of the CG, the plane acts like a tail-dragger land plane. And if it is behind the CG, the plane acts like a tricycle-gear land plane. This feature of seaplanes makes them unique: the point of rotation (the step's tip) can be placed exactly where it is most desirable.

Q. ***Does a seaplane need more power than its land plane equivalent?***
A. Yes, because of the increased drag caused by the floats. On the other hand, if floats are added to the usually overpowered land plane, the same power will fly it handily, bearing in mind that seaplanes are not intended to be aerobatic. Many seaplanes are capable of aerobatics, however.

Q. ***Are there any tricks to getting on the step?***
A. If the step is below the CG, it should not be a problem to get the plane on the step. Takeoff should be very similar to a land plane: advance the throttle and turn into the wind. When the model rises onto the step, pull back on the stick for takeoff. If the model is reluctant about getting onto the step, try a touch of down-elevator followed by up-elevator. This usually works, despite the doubts of inexperienced seaplane pilots.

In the early days of seaplanes, long hulls were popular. Typically, the NACA long, planing hull was used. These hulls worked well with high-lift airfoils that needed little rotation to provide the lift required for takeoff.

Q. ***Is a water rudder really necessary?***
A. Yes. The ability to steer on the water is one of a seaplane's most important capabilities. Seaplanes weathercock easily, and without a water rudder, steering them is a continuous challenge.

Q. ***Why are model seaplane hulls and floats frequently flat-bottomed?***
A. Flat bottoms on full-size seaplanes are impractical because of the landing forces that would result: water is hard when struck at an appreciable speed. This is not a concern with models, which do not have humans aboard and are mostly very strong for their size. Flat bottoms are easy to construct and have an inherent ability to push the water spray out sidewise away from the propeller.

Q. ***If a land plane is converted to a seaplane, will it need a sub-fin?***
A. If the model fishtails in flight, it lacks lateral stability because of the side area in front of the CG that is added by the floats. Additional vertical fin area or a sub-fin will correct this condition.

CONCLUSION

R/C seaplane models work well and provide reliable fun. The scale side of model seaplanes also continues to improve with the introduction of bigger and/or better models. Fred Tuxworth's giant Loening flying boat comes to mind as a great example.

Seaplane design is not complicated. The rules are few, and all of them have comfortable, logical explanations. Join the seaplane trend this summer.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

MODEL AIRPLANE NEWS

PRODUCT REVIEW

MVP & SKS Videos

by GREG GIMLICK

Something for those rainy days

AMA Two-Video Collector's Set

ONE THING about modelers is that if we aren't flying our models, we want to be talking, reading, or watching videos about them. This year, the AMA had Model Video Productions produce a two-video set: the "Celebration of Eagles" and the "1996 Nats Highlights." The $29.95 set arrived in a nicely colored gift box that will look great on the bookshelf, but I was so anxious to watch them that I went straight to the VCR.

The "Celebration of Eagles" video is truly a walk down the memory lane of aeromodeling in our country. If you aren't aware of it already, this gathering by the AMA celebrated all the "big" names in our modeling past and present. Given the special nature of this gathering, this video may well be the only way you'll have to see people like Bill Brown, Maxwell Bassett, Vic Cunningham Sr., John Worth, Joe Kavel, Sal Taibi and Leon Shulman all in the same place. This list is by no means complete, but we get to meet and hear them talk about their models, engines and how it has all developed over the years. This is a nostalgia piece that is worth the price of admission.

The second tape of the set covers highlights of the 1996 Nats. The video is well-done and narrated by Bob Benjamin, and as he says, they present "the most exciting and most popular events." It could be called a "Nats Sampler" because you get a taste of most of the events, but absent are the Soaring, Free Flight and Electric competitions. Each tape runs about an hour, but for my money, I would like to have seen about 15 minutes more of the Nats so that they could have included the other areas.

Overall, the AMA has put together a fine set of videos, considering how difficult it would be to completely cover six weeks of competition, and they are well worth the money. Most single videos are this price and may run for only an hour; here, you get two full hours of professionally shot and narrated film that any club, school, or modeler would be glad to own.

GREATER SOUTHWEST FAN FLY, CATAPULT JET RALLY & SUPERMAN JET RALLY

SKS Video Productions has set out to provide avid jet enthusiasts with two videos that should satisfy their urge for ducted fan information. If you have "the need for speed," one of the featured jets is bound to pique your interest.

The 14th Annual Greater Southwest Fan Fly and Catapult Jet Rally video is narrated by Scott Stauffer of SKS. Event coverage begins in Slaton, TX, where you are immediately introduced to a huge, 48-pound A-10 Warthog powered by Dynajet fans. It loses a main wheel on takeoff, and after an uneventful flight, you're treated to a nice belly landing that results in little noticeable damage. You'll get to see Bob Violett's turbine-powered Bandit and a beautiful twin-engine B-2 Stealth Bomber—among others—before you take a brief trip to the Texas Air Museum for a tour of their relatively new facility, which is shaping up nicely. Once your tour there is complete (it takes only a few minutes), you head to Lakehurst, NJ, for the Fifth Annual Catapult Jet Rally, where, in the shadow of the infamous hangar one of Hindenburg fame, you're treated to more jets. The highlight of this segment for me was the flight of Kerry Sterner's Rutan Ares, which is not only unique, but superbly done and flew as good as it looked.

Of the two videos, my favorite is the Eighth Annual Superman Jet Rally coverage. The video shows several turbine-powered jets that were really impressive; the sound and performance are just awesome. One of the featured segments is an F4 Phantom review that displays six BVM-powered F-4s. An experimental XV-85 Goblin is seen on its first flights, and you'll find yourself caught up in the excitement and cheering it on with the crowd, but I don't want to ruin the fun, so you'll just have to see for yourself.

Both videos are done with the modeler in mind, and each pilot and model is introduced before you see it fly. The introduction is usually done by the modeler providing the details and Scott Stauffer filling in as necessary. We see everything from sport fan trainers to experimental prototypes. Very little is left to the imagination, and one can easily get a good idea of the equipment necessary to seriously pursue an interest in jets. The video work is superb. If there is any shortcoming, it is the audio, which is sometimes a bit "busy" with engines running in the pits; music is dubbed in, and the muffled announcer is heard in the background. There are some great descriptions of the fuel and oil systems and an overview of the Golden West system that are very educational.

Whether you have a passion for jets or just a passing interest, you'll find these tapes an enjoyable way to spend some time and learn a bit more about what's new in our hobby. Each one runs for about an hour and a half and comes in an illustrated plastic container.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

GREAT PLANES MODEL MFG.

FW-190

A quick-build, sport-scale warbird

by CRAIG TRACHTEN

SCORE another one for Great Planes for their Focke-Wulf FW-190, the newest model in the Legendary Warbirds Series. The Focke-Wulf takes its place next to the P-51 Mustang and the Spitfire—great .40-size, ARF warbirds. As with all the Great Planes kits I have been exposed to, the fit, finish and documentation of the Focke-Wulf are excellent.*

PHOTOS BY GERRY YARRISH & WALTER SIDAS

CONSTRUCTION

Wing construction is as with most ARFs. Start by epoxying the two-piece wing joiner together. You also have to epoxy on the root ribs. When doing this, make sure you clean off any epoxy ooze that may get in the way of the wing joiners (forward and aft). The aileron servo tray consists of three pieces of plywood that are CA'd to the wing joiners. Be careful; CA will melt foam. If you install retracts in your kit as I did in mine, the "step" in the forward root rib must be removed for the retract servo to fit properly. Epoxy in two ¼-inch wing dowels and the wing-bolt reinforcement plate, and the wing is complete. All hinges (except the three rudder hinges) are factory installed.

Putting the fuselage components together couldn't be easier. The motor mount holes have been drilled and the blind nuts installed. Slide the supplied two-piece adjustable motor mount together and screw it into place. The servo tray is a single piece of ply that fits in and locks to formers 4 and 6. After you test for proper fit, apply a bead of 6-minute epoxy and servo-tray assembly is finished. The wing bolt plate is easy to install. Drop in the blind nuts, hit the flanges with thin CA to hold them in place, apply a healthy helping of 30-minute epoxy, and—boom!—it's finished. Installing the tailwheel requires that you use a ruler

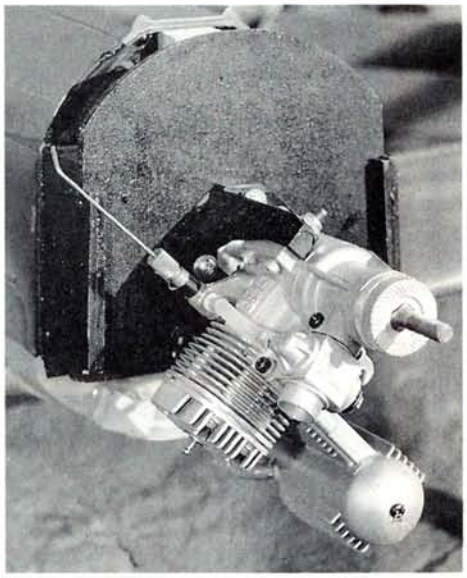
and a hobby knife, and the last step in fuselage construction is to epoxy on the plywood stabilizer support.

To mount the wing, insert the wing bolts from the inside so that the threaded end protrudes just above the wing bolt plate. This will allow you to mark the mounting holes in the wing for proper alignment. Insert the front wing dowels in place. Measure the distance from the centerline of the tail to the wingtip. When the distances from the left and right tips to the tail are equal, press down on the rear of the wing. The wing bolts will dimple the wing where you should drill the holes for the wing bolts. Leave the wing in place for the next steps.

TAIL AND LANDING GEAR

Epoxy the horizontal stabilizer to the stab support plate, making sure that the tips are equidistant from a center point on the firewall. Also make sure that the horizontal stab and wing are "parallel." (Because of the dihedral, parallel really can't be achieved.) What I do is put a paint can under each wingtip (same spot on each side). I do the same with the horizontal stab. Note: since the horizontal stab is attached to the top of the fuselage, the airplane has to be upside-down. Check to see that the horizontal stabilizer makes full contact with the mounting plate when aligned. If not, lightly sand the high side of the fuse to achieve full contact. For the record, I didn't have to do any sanding on the Focke-Wulf because everything lined up perfectly. I also periodically check to make sure that the stab hasn't slipped out of place. After the assembly has dried, epoxy in the vertical fin as instructed. Trim the fin fairing to fit and epoxy it into place. Now install the rudder. This requires a test fit, a cut with your hobby knife for the tailwheel wire and CA and epoxy for the rudder hinges.

I chose the optional retracts and used Hobbico's* low-profile retracts. It takes some time to install and uninstall the retract/pushrod assembly to make minor bend adjustments, but it is time well spent. Make sure everything moves smoothly and there is no binding. After installation, I temporarily hooked up my radio to check the setup. I flipped the switch and the gear came down. I flipped it back and they went up—no noticeable binding. "Sweet" is the only way to describe it!



At the high end of the recommended engine range, this O.S. .46-FX powered the model nicely.

SPECIFICATIONS

Manufacturer: Great Planes

Name: Focke-Wulf FW-190

Type: semi-scale ARF warbird

Length: 47.5 in.

Wingspan: 58.6 in.

Wing area: 568 sq. in.

Weight: 6 lb., 4 oz.

Wing loading: 25.35 oz./sq. ft.

Engine req'd: .46 2-stroke, or .48 to .70 4-stroke

Engine used: O.S. .46-FX 2-stroke

No. of channels req'd: 4 with fixed gear, 5 with retracts

List price: $299.99

Features: 90-percent prebuilt, all hardware included, painted plastic parts, authentic markings.

Comments: the construction photos in the instruction manual are really easy to understand, and the fit, finish and documentation of the Focke-Wulf are excellent.

Hits
- Excellent documentation.
- High-quality materials.
- Fine attention to detail on the graphics.

Misses
- None.

FLIGHT PERFORMANCE

• *Takeoff and landing*

Takeoff was surprisingly uneventful. Although the model left the ground sooner than I would have liked, I kept the nose level, built airspeed and climbed out to altitude. A blip of the rudder was all that was needed to keep the wings level. At altitude, only minor trim adjustments were needed to fly hands-off at ½ throttle. Landings were not very different from those of most tail-dragger trainers. The only difference is that you should bring the model in a little faster. The Focke-Wulf showed no signs of wanting to tip-stall. Just over the outer marker of the field, about 4 feet in the air, I chopped the throttle, and the aircraft settled in.

• *High-speed performance*

"Excellent" is the only adjective to describe the Focke-Wulf's high-speed performance. It tracked well and effortlessly went where I pointed it.

• *Low-speed performance*

"Surprising" is how I would describe the low-speed performance. I truly expected a more violent stall than what I got. When the Focke-Wulf stalled, it broke left and went nose-down. A little power and up-elevator put you back straight and level. As long as you keep up airspeed, the model won't tip-stall on you.

• *Aerobatics*

Too much fun! Rolls to the right were crisp and axial. Rolls to the left were a little slower, but also axial. For inverted flight, a little down-elevator was needed. Loops, inside and out, were symmetrical without any other control-surface input except elevator.

Top-shelf is the only way to describe the quality of materials used, and the construction photos in the instruction manual are really easy to understand.

RADIO INSTALLATION

Any quality 4-channel radio will work well if you use fixed gear. If you use retracts, as I did, you'll need 5 channels. I used my Futaba* 8UAF. For the ailerons, elevator, throttle and rudder, I used standard Futaba S148 servos. For the mechanical retracts, I used the recommended Hobbico low-profile retract servo. Servo installation is similar to that of just about every other ARF on the market. Control-rod installation (elevator/rudder) was easier than most because the pushrod guides are factory installed.

There's more than enough room in the fuselage to provide easy access and installation. The receiver battery is placed in front of the servo tray under the soon to be inserted fuel tank. The fuel tank will hold the battery in place. Don't be concerned that the battery is *under* the fuel tank; you're working upside-down. The battery will be on top of the tank when you're flying, so any fuel that leaks out shouldn't get to the battery.

FUEL TANK AND ENGINE

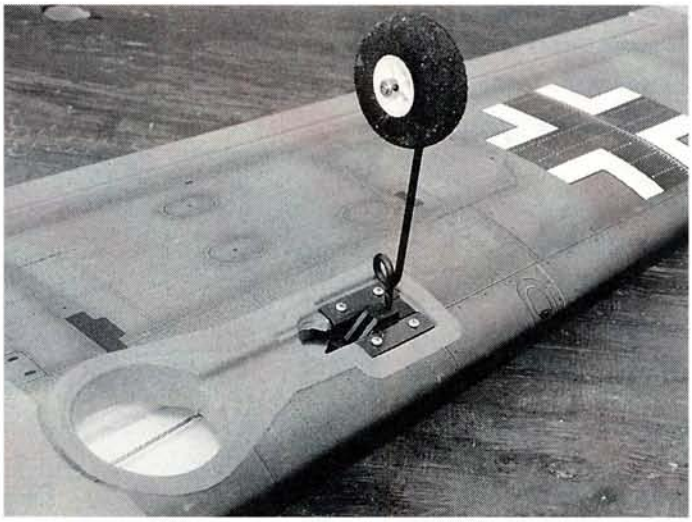
"Been there, done that," is what I can say from here on. This is one step that most builders just glance at and then go to work. Guess what? My Focke-Wulf flew great—for 3 minutes at a time. You guessed it; I installed the tank upside-down. Follow the instructions, and remember that during installation, the fuselage is upside-down. Also note that the tank will fit only one way. When it didn't fit, I flipped the tank without re-orienting the clunk and vent tube. My vent tube was now on the bottom.

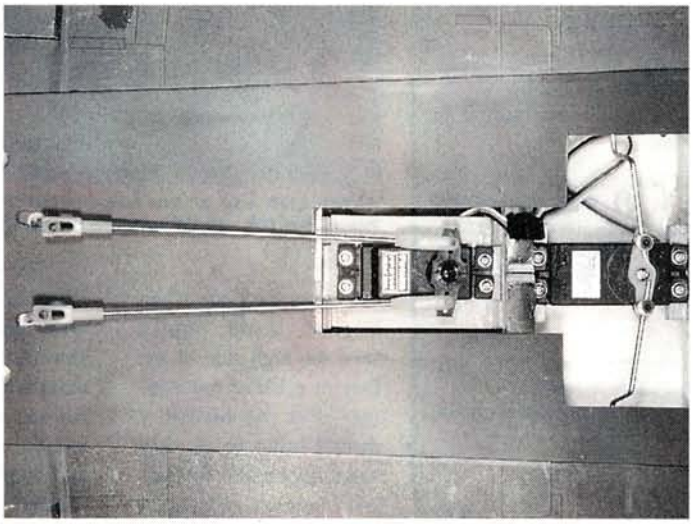
I always try to use a powerplant at the high range of what's recommended. In this case, .40 to .46 2-stroke, I used an O.S.* .46-FX. I broke it in (on the bench, not in the plane), and it performed flawlessly, as expected. I used a Master Airscrew* 11x7 wood prop. Mounting the engine was easy. Measure 4 9/16 inches from the firewall to the front of the thrust washer, mark the holes and drill. I used bolts, washers and locknuts instead of the supplied sheet-metal screws. Either will work fine.

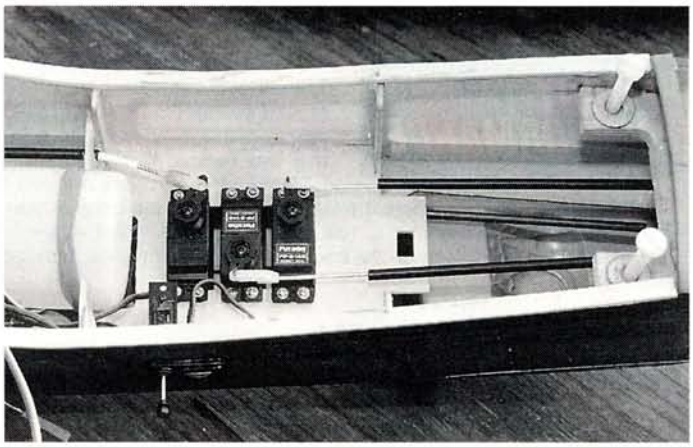
If you're a 4-stroke kind of guy, install an O.S. 70 Surpass on your warbird. The Great Planes P-51 and Spitfire that I've flown were each powered by a .70. You're in for a treat.

Installing the cowl is the second most time-consuming building process. First, epoxy on three hardwood mounting blocks. That's the easy part. Next, mark all the areas that will be cut out. I also drilled a hole so I could install a needle-valve extension and another so I could insert a thin screwdriver to adjust my low-speed needle (I hate to remove the cowl to make adjustments). I drilled another hole so that I could install a Great Planes fuel-filler valve.

To achieve balance, I had to install a 2-ounce Great Planes heavy hub under the spinner and epoxy a 1.2-ounce lead bar to the cowl. I was surprised that after I added all this weight, my aircraft still came in at the low end of the stated weight range.







Top: Hobbico's low-profile retracts took a little time to install, but they really add to the model's scale appearance. Middle: the aileron and retract servo setup. Above: there's more than enough room in the fuselage to provide easy access and installation. The pushrod guides for the elevator/rudder control rods are factory installed.

FINAL THOUGHTS

The Great Planes Focke-Wulf FW-190 is another fine addition to the already superb line of Legendary Warbird ARFs. Top-shelf is the only way to describe the quality of materials used, and the construction photos in the instruction manual are really easy to understand. Detail the cockpit and pilot with Testor's* Modelmaster WW II German military colors, and you'll have a great looking airplane.

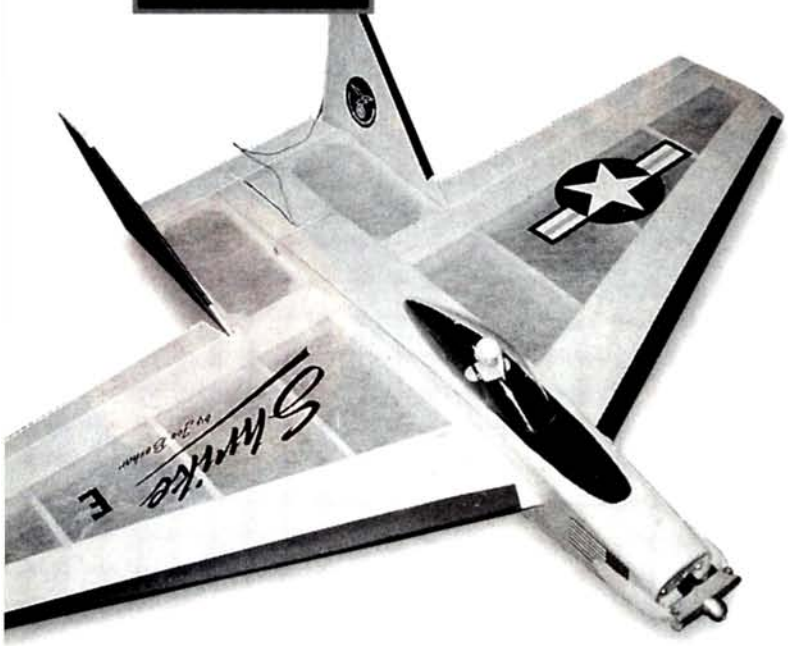
**Addresses are listed alphabetically in the Index of Manufacturers on page 134.* ✚

MODEL AIRPLANE NEWS
HOW TO

Electrifying a Lanier Shrike

Convert a Small Glow Plane to Electric

by JOE BESHAR

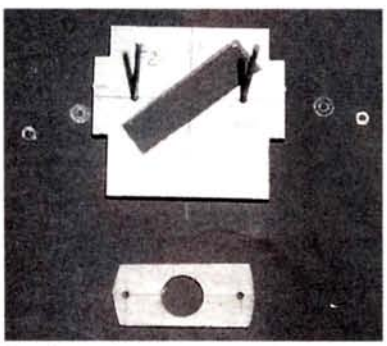


THE SHRIKE is manufactured by Lanier RC* and, with a .10 or .15 glow engine, it has proven itself a fun and exciting sport model. But I enjoy the reliability and clean and quiet nature of electric power, so I decided to convert the Shrike. The results were not disappointing. Powered by an AstroFlight* Cobalt 05 motor and 7,800mAh cells, my Shrike-E weighs 32 ounces. With a SonicTronics* 7x4.5 prop, this system produces 21 ounces of static thrust—more than adequate for good performance.

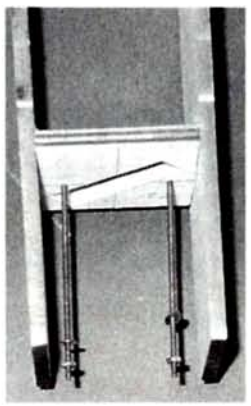
Before you build the Shrike-E, it is imperative that you familiarize yourself with the building instructions supplied with the kit. Few changes are required to convert the Shrike to electric, so let's get to it.

BUILDING MODIFICATIONS

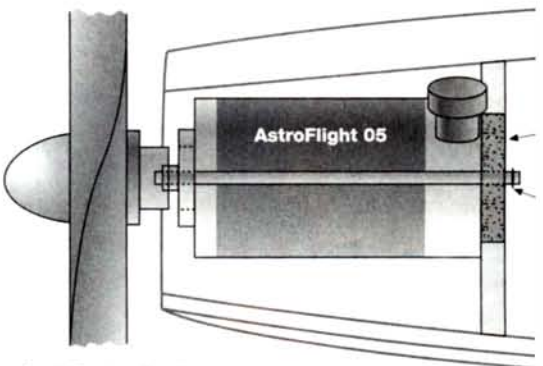
Begin by reworking F2 and F3 as shown in Figure 1. F3 is installed upside-down relative to the orientation shown in the kit. Drill and tap the 2x56 holes in F2 as indicated. From 1/8-inch plywood, cut out the motor hold-down plate. Build the model as detailed in the kit instructions, but use the reworked formers. Assemble and glue into place a 3/16-inch balsa battery platform as shown in Figure 2, and coat



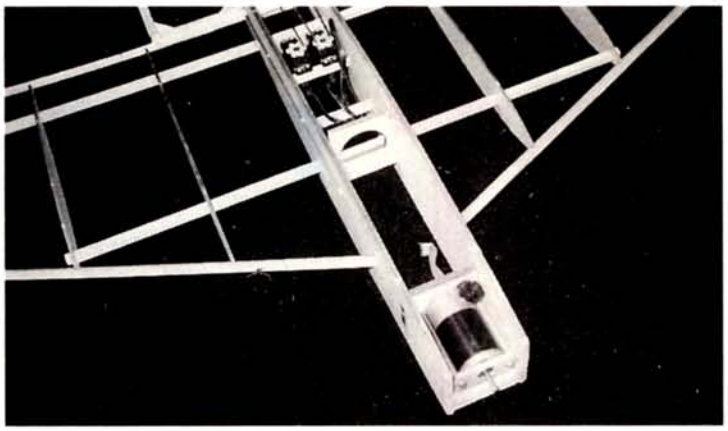
Here's the important conversion assembly. F2 is slotted to permit the brush wires and the rear of the motor shaft to protrude into the area to the rear of the former. The two threaded rods are used to pull the motor hold plate firmly against the front of the motor.



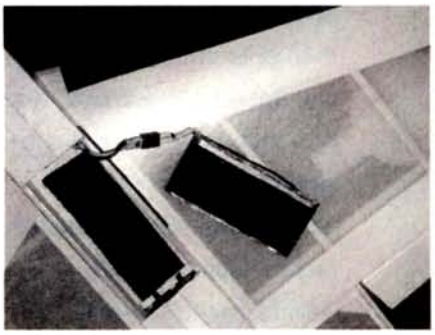
A view of F2 glued into place showing the two threaded rods that will hold the motor in place.



SonicTronics 7x4.5 folding prop



A view of the Shrike-E prior to sheeting. Note the orientation of F3 and the motor mount.



The battery platform is accessible from the bottom and the battery is held in place with Velcro®.

The completed Shrike-E with the top access hatch removed.

with Balsarite and apply Velcro®-brand fasteners to the platform bottom. When building the fuselage, leave an opening to allow removal of the battery.

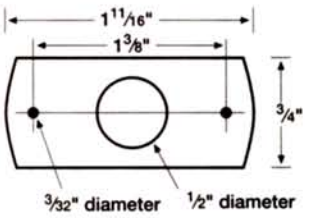
I used Airtronics* microlite servos for minimum weight and size and a Jeti* BEC motor controller in the positions shown in Fig. 2. Adjust battery placement to achieve proper balance.

I used micafilm on my Shrike-E, as it's light, yet tear-resistant. Apply a strip of ¼x4-inch Velcro® (pin side) to both sides of the fuselage to provide a non-slip grip point while you're launching the aircraft.

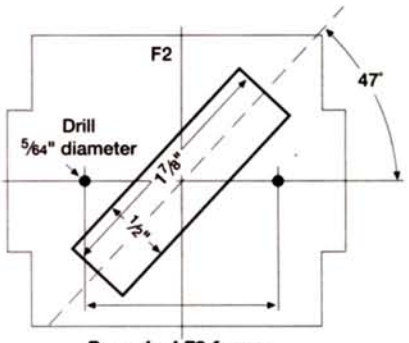
Once you've completed your Shrike, check all the electrical circuits and range-check the model with the motor running. Launch the Shike into the wind and enjoy.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

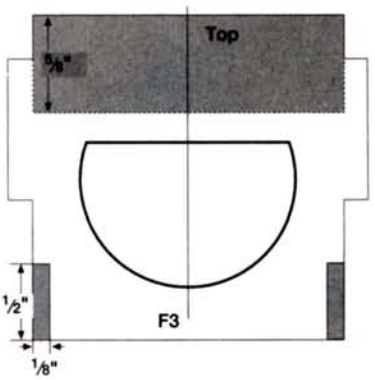
Figure 1. Shrike "E" former details



1/8" plywood motor hold plate



Reworked F2 former



Reworked F3 - Cut out gray areas and install upside down.

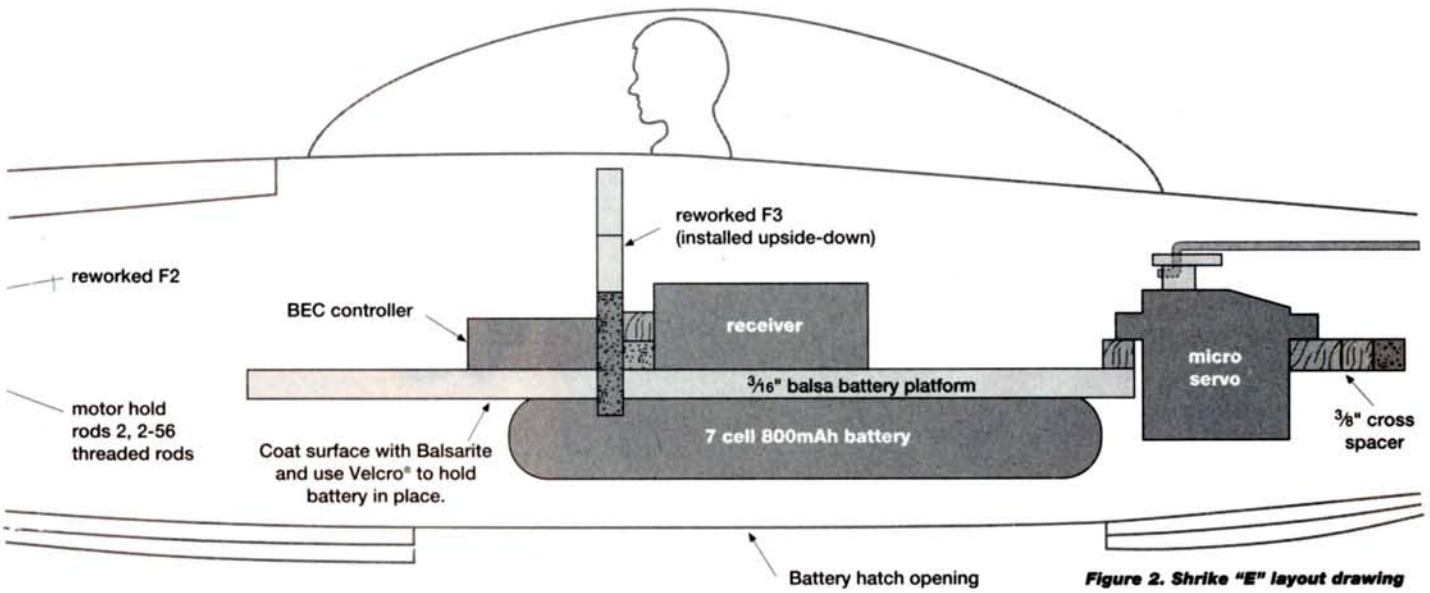


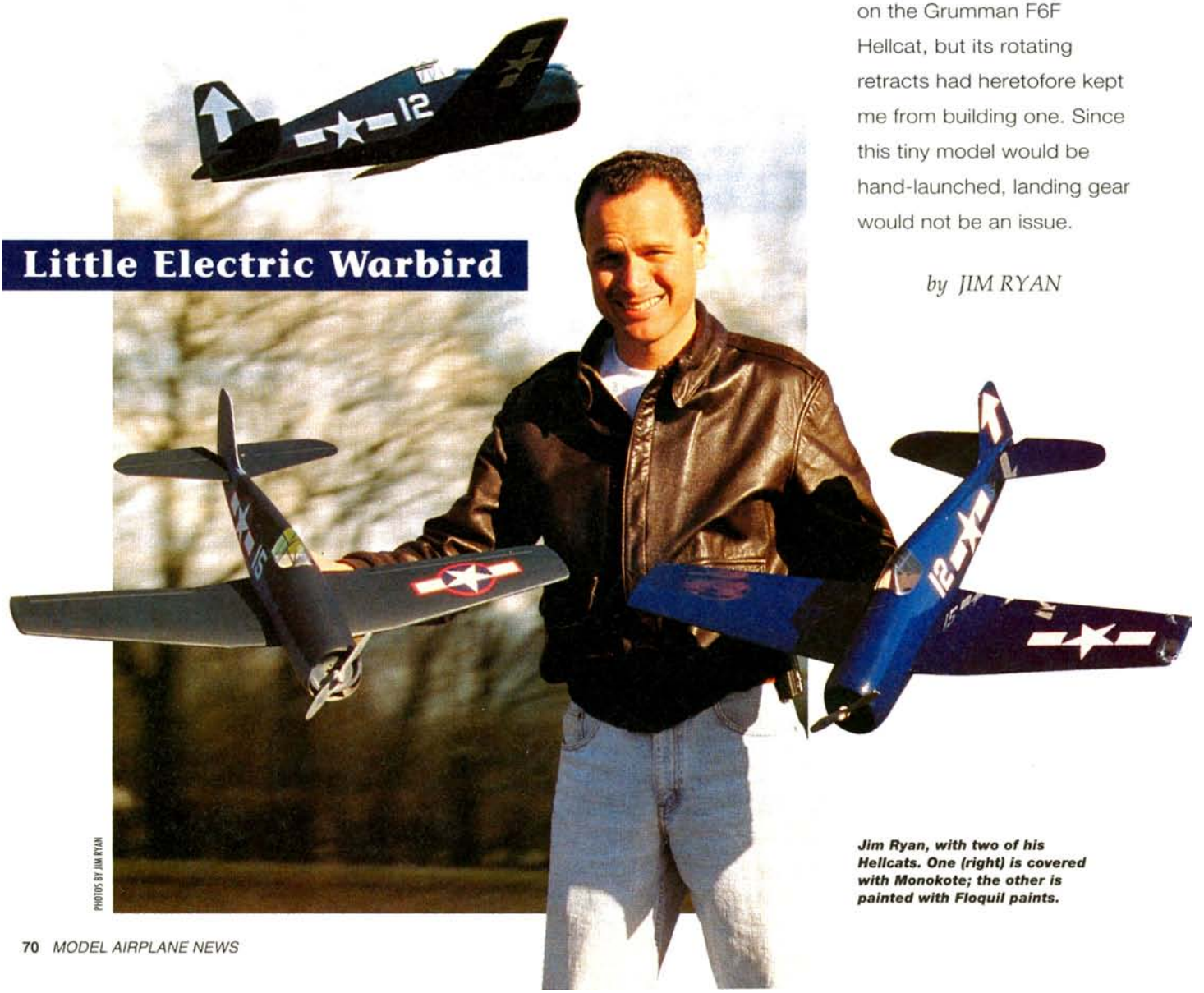
Figure 2. Shrike "E" layout drawing

F6F HELLCAT

Little Electric Warbird

THIS PROJECT had its beginnings in the summer of 1995, when I first became interested in electric flight. I rarely do things the easy way, so for my first project, I bypassed the sport planes and motor gliders on the market to scratch-build a tiny Speed 400 warbird. Not only that, but I chose a subject with a radial engine. I have a long-standing fixation on the Grumman F6F Hellcat, but its rotating retracts had heretofore kept me from building one. Since this tiny model would be hand-launched, landing gear would not be an issue.

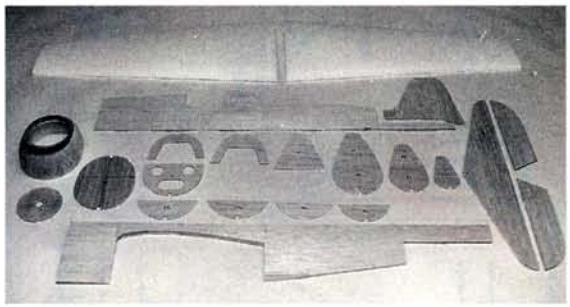
by JIM RYAN



PHOTOS BY JIM RYAN

Jim Ryan, with two of his Hellcats. One (right) is covered with Monokote; the other is painted with Floquil paints.

I obtained a 3-view and began designing the model. Since my online discussions with experienced electrics flyers suggested that weight was critical, I began by weighing my flight-system components, which tipped the scale at almost exactly 12 ounces. This meant that my completed airframe had to weigh a mere 6 ounces if I was to make my target of 18 ounces. As it turned out, my first attempt overshot this goal by over 2 ounces, and the test flights were not successful. After gaining experience with other Speed 400 models, I realized I'd missed some opportunities for weight savings, and I built a second version in time for the 1996 KRC. The result met all my performance expectations for a small, inexpensive warbird and certainly justified the additional effort.



Here's the complete "kit," which can be cut out in one or two evenings. The wood should be selected for straight grain and light weight. Note that the cowl block is already partially carved to shape.

CONSTRUCTION

The construction of the Hellcat follows my belief that simple models can be light models. I tried to keep the part count as low as possible. One note on adhesives: I use regular thin CA for most construction, but this adhesive will attack foam. For all wing construction, I recommend foam-friendly odorless CA or an aliphatic adhesive.

The foam wing-cores and the vacuum-formed canopy are available from me for $20, postage-paid. Send a check or money order to Jim Ryan, 6941 Rob Vern Dr., Cincinnati, OH 45239; (513)729-3323.

Wing: the foam-cores are lightly sanded, and then the 1/16-inch sub leading edges are installed with thick odorless CA and trimmed flush. The cores are sheeted with 1/32-inch balsa. I used 3M Super 77 contact adhesive to save weight. Then the leading edge caps are installed and sanded to shape, along with the balsa wingtips.

The original F6F featured a flat center section with the polyhedral joints part way out along the wing. The wing panels should be cut apart at the polyhedral joints and then beveled with a sanding block so they'll join at the correct angle. Cut the ailerons out of the outer wing panel and apply 1/8-inch balsa to the exposed TE. Trim 1/4 inch from the LEs of the ailerons and install their 1/8-inch balsa LEs. If you wish, you can trim the ailerons shorter and face their ends with 1/32-inch balsa. Block up the wingtip by 1 3/8 inch, join the outer wing panels to the inner with thick odorless CA, then apply 1.5-ounce glass reinforcement tape with thin odorless CA. Use the same technique to join the wing halves on a flat surface. Next, install the aileron torque rods. Note that the torque rods mate with the ailerons at the very end, forming the inboard hinge for the surface. The other

Above: once the wing-cores have been sheeted and the leading edges and wingtips have been shaped, the wing panels are cut apart at the polyhedral joint and beveled to the correct angle. After cutting the ailerons free, rejoin the panels with 1 3/8-inch polyhedral per panel.

SPECIFICATIONS

Model: F6F Hellcat Speed 400

Type: 1/17-scale electric warbird

Wingspan: 30 in.

Length: 23 in.

Wing area: 165 sq. in. (1.15 sq. ft.)

Weight: 18 oz. (as flown)

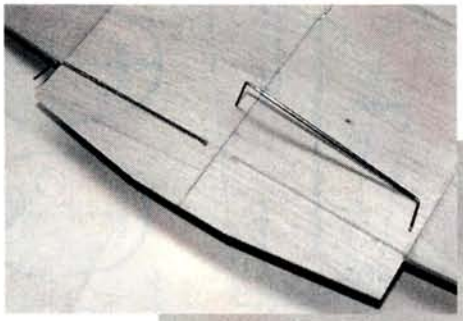
Wing loading: 15.7 oz./sq. ft.

No. of channels req'd: 3 (speed control, elevator, aileron)

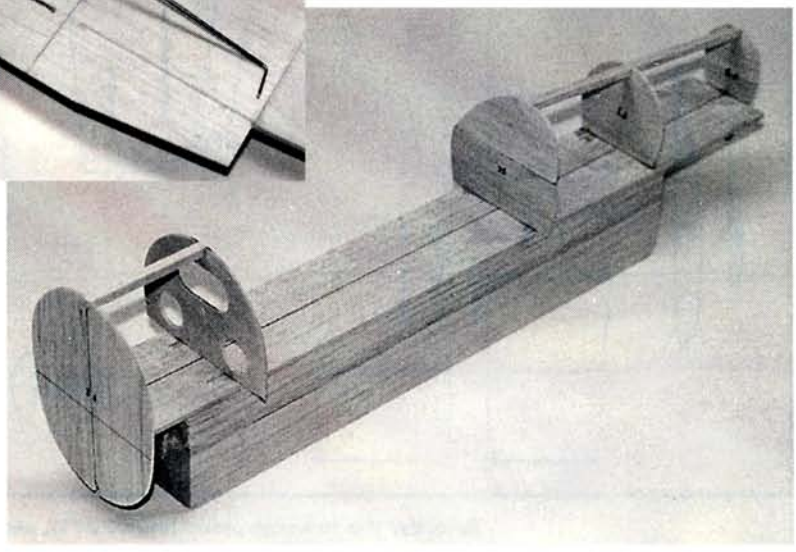
Power: 6V Graupner* Speed 400, 7 Sanyo 600AE Ni-Cds, micro speed control with BEC

Features: thinned Clark Y airfoil, foam-core wing, simple balsa construction.

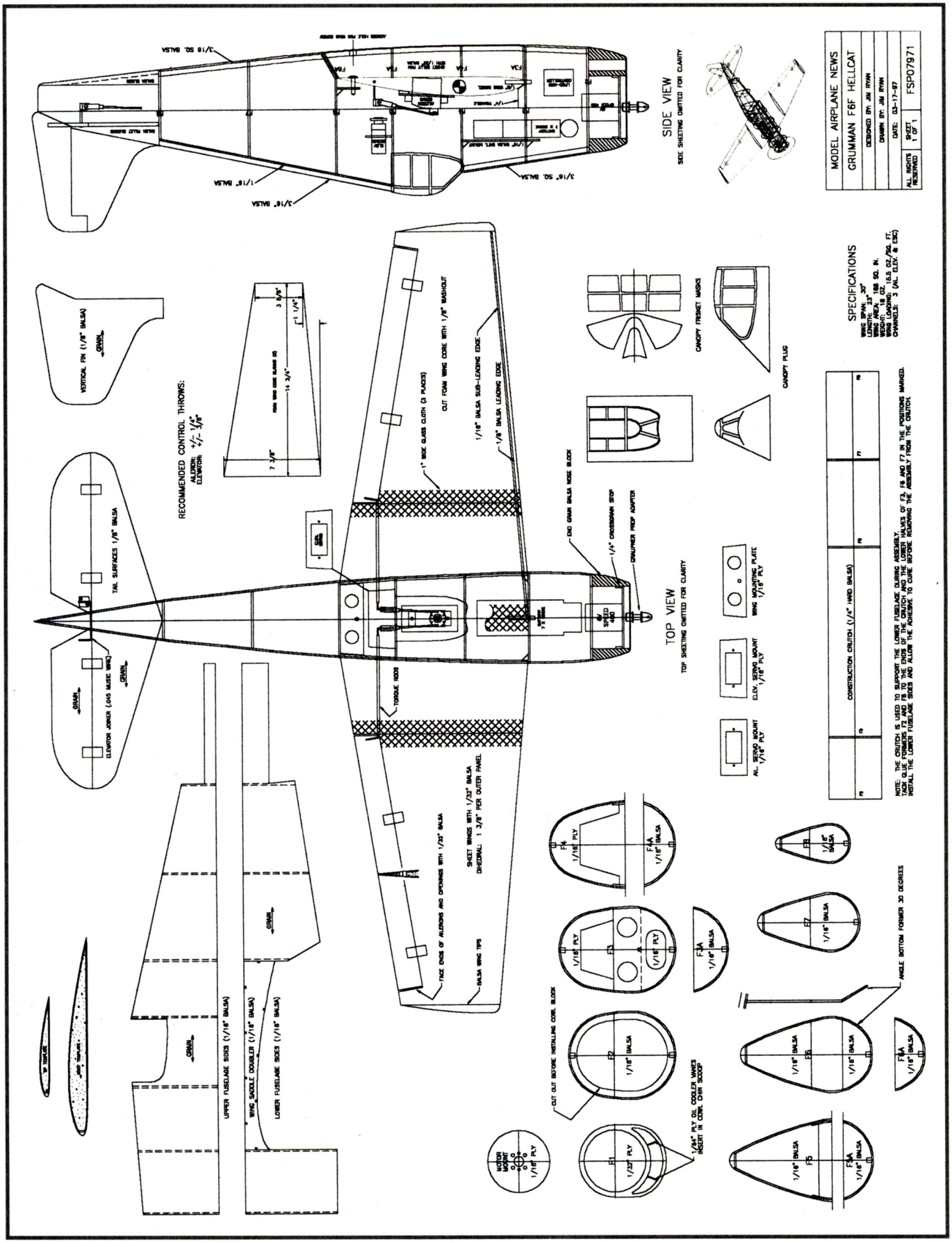
Comments: while simple in structure, the Hellcat is very true to scale; the thinned wing is the only significant deviation. Weight is critical, and the builder must resist the temptation to add surplus reinforcement. Because of its small size and short coupling, it's targeted at experienced modelers, preferably those with some electric experience.



Left: the torque rods are installed in slots cut in the bottom of the completed wing. Be careful not to allow glue to get inside the torque tubes. After the torque rods have been positioned, the slots are filled in with balsa and sanded flush.



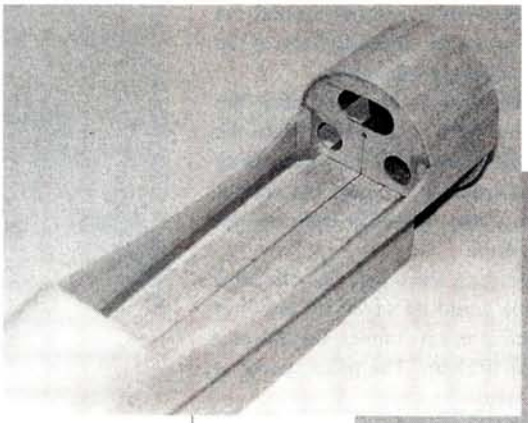
Right: the lower formers are tack-glued to the crutch, and the 3/16-inch keel stringers are installed. Note the angle of the lower portion of F-6. Here, the crutch rests on a wood block.



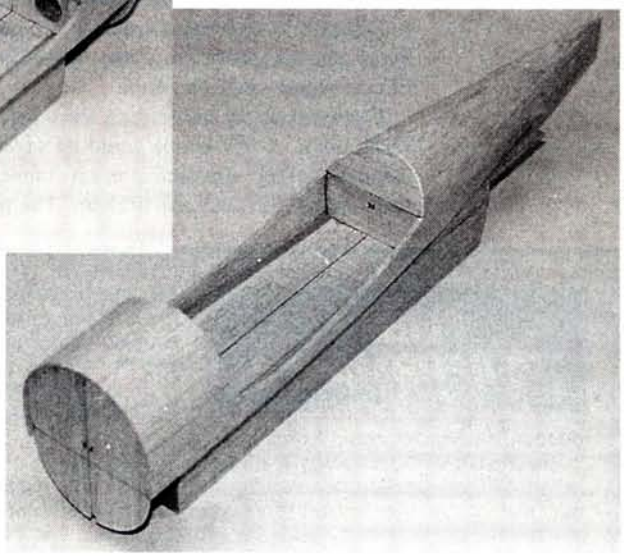
To order the full-size plans (FSP07971), see Pilots' Mart page 113.

hinges are spaced farther out so that the aileron doesn't bind at the polyhedral joint. The easiest way to install the torque rods is to cut through the bottom sheeting, remove the underlying foam and then install the torque rods before filling in the slot with balsa and sanding it flush. Cut the hinge slots and dry mount the ailerons. I recommend that you install the aileron servo mount after covering the wing.

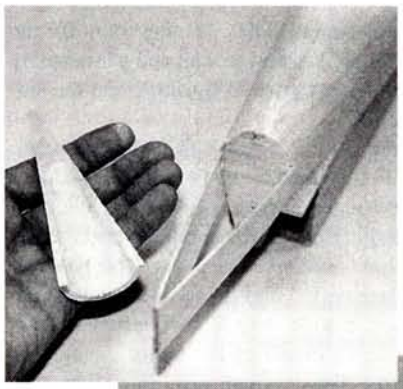
Fuselage: the fuselage is built as top and bottom halves, as that makes it easier to ensure a light, straight assembly. The bottom halves of formers F-3, F-6 and F-7 are tack-glued along the centerline of the crutch, and F-2 and F-8 are tack-glued to the ends of it. Note that F-6 must be cut and rejoined at the proper angle to allow removal of the wing. Install the 3/16-inch balsa keel



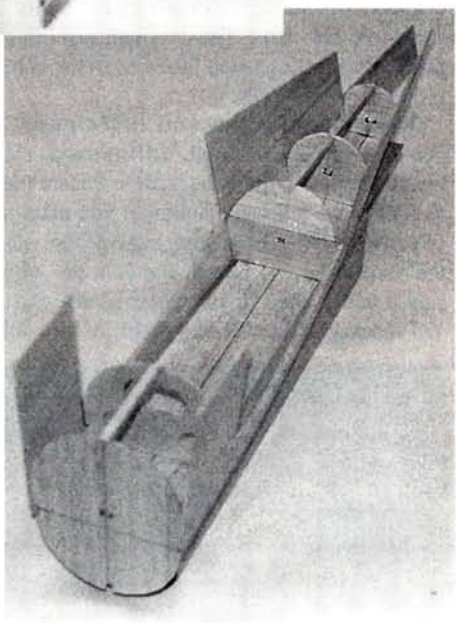
Left: short pieces of 1/4-inch triangle stock reinforce the high-stress area at the front of the wing cutout.



Right: the lower half of the fuselage is now complete, and it's ready to remove from the crutch.



Left: after the tail block has been carved to shape, it's removed and hollowed out before being permanently glued into place.



Right: the lower fuselage sides are glued to the formers and then wetted and glued into place. Work with both sides together so that you don't build stresses into the assembly.

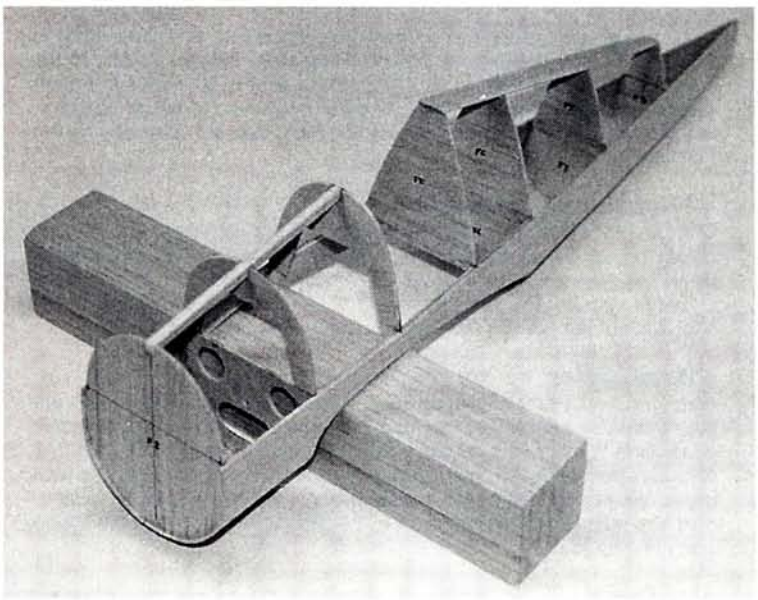
stringers. You can save weight if you cut your stringers from 6- to 8-pound 3/16-inch balsa sheet instead of using the heavier stock that's usually sold as stringers.

Install the precut lower fuselage sides, aligning their edges with the lower formers. Wet the lower fuselage sides so that they'll bend readily, then carefully trim them so that they'll join over the 3/16-inch stinger. Apply thick CA to the formers and push the fuselage sides into place, running a bead of thin CA down the seam. Install the wing saddle doublers.

Tack glue the tail block into place and carve it to shape; then, remove it and hollow it out before gluing it back in place permanently.

Carefully remove the lower fuselage from the crutch and apply 1.5- or 2-ounce fiberglass "doublers" to the inside surface of the lower fuselage sides between F-2 and F-3. Also, install 1/4-inch triangle stock to F-3 at the leading edge of the wing. This will help to reinforce this high stress area. CA the upper formers to the lower formers. Also install formers F-4 and F-5, which have no lower halves. Install the 3/16-inch balsa stringer to the front formers, and the 1/16-inch sheet sub-turtle deck to the rear formers. Then edge-glue the top sheeting to the bottom sheeting, and wet it so that it will conform to the

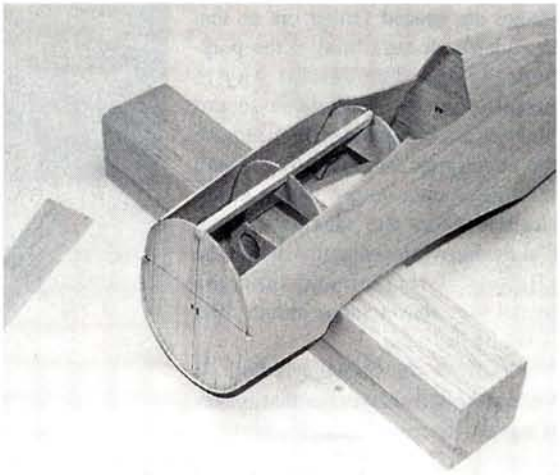
Below: after the upper formers have been installed, the 3/16-inch forward stringer and 1/16-inch sub-turtle deck are added.



upper formers. You'll get a better contour around the nose of the fuselage if you cut the sheeting back to the cockpit and plank the top decking separately.

The 3/16-inch turtle deck cap is glued on after the upper fuselage sheeting has been sanded flush with the sub-turtle deck. The tail fillets are glued into place using a T-shaped 1/8-inch balsa spacer as a guide (be careful *not* to glue the spacer into place). The turtle deck and tail fillets are now sanded to shape.

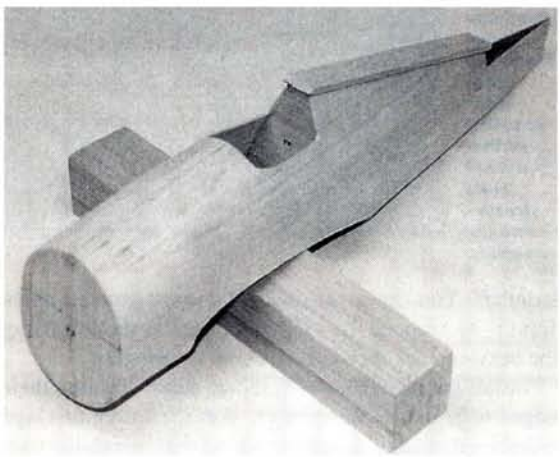
Empennage: the tail feathers are simple 1/8-inch balsa sheet stock. A few grams could be saved by building them up, but this approach is much simpler. Cut the elevator hinge slots and test fit them. The balsa spacer is now removed from the tail fillet. Dry-fit the vertical fin and stabilizer, and test-fit the elevator joiner. Glue filler pieces at the rear of the tail fillets, leaving room for the stab and joiner. I found it easiest to wait and permanently install the vertical fin just prior to finishing and the stabilizer *after* finishing.



Above: because of the slight compound curvature of the nose, it's best to plank it separately as shown.

Cowl block: the cowl is a block of end-grain balsa. The 1/32-inch ply F-1 is glued to the face and is used as a guide for cutting out the engine opening and the chin scoop. Before installing the cowl, cut out the center of F-2 to the dashed line shown in the plans. The block is then glued into place on F-2 and is carved and sanded to final shape. A 1/4-inch-wide strip of *cross-grain* balsa is installed around the perimeter of the motor opening as shown in the plans. The 1/16-inch ply motor mount is installed against the stop. The fins in the chin scoops are scraps of 1/64-inch ply.

Wing installation and belly pan: install the 1/16-inch ply wing mount, drill through the wing and install the 6-32 nylon wing screw. Square the wing with the tail of the fuselage, pinning it into place in the proper position. Drill the leading edge of the wing to accept the 1/8-inch locater dowel. Remove the wing and reinstall it with a sheet of wax paper sandwiched between it and fuselage. Glue the belly pan formers into place on

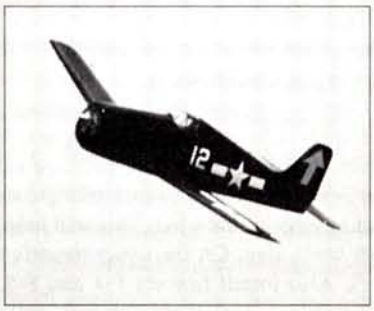


Above: once the fuselage sheeting has been attached and trimmed, install the 3/16-inch turtle-deck cap and tail fillets.

FLIGHT PERFORMANCE

Be very careful checking the CG; this model is short-coupled, and experience has shown that it is not tolerant of an aft CG condition. If you keep the weight to around 18 ounces, the Hellcat should fly just fine.

Business travel prevented me from test-flying the finished Hellcat before KRC, so on Saturday morning, I walked out onto the field to conduct the maiden flight in front of a swelling throng of spectators and fellow pilots. I lost a bit of speed in the initial climb-out, and that made for a few tense moments, but after recovering, the model found its stride and flew beautifully, even at reduced power. I did one timid roll and a few low passes before landing early. After the maiden flight, I added a seventh cell to the battery pack to improve power, and subsequent flights showed the Hellcat to be a stable model in the hands of an experienced pilot.



• Takeoff and landing

I strongly recommend getting a capable assistant to hand-launch the model on the first flights. The model needs to be thrown firmly and straight out. If the launcher lobs it upward, it's likely to stall. Hold the wings level and let it climb slowly as the speed builds up. Poor launches can result in some very interesting moments. A good technique is for the launcher to throw the model firmly from a dead run.

Landings are made with a straight-in approach, and the model is simply held just off the ground until it settles in. Thanks in part to the washout, the Hellcat doesn't show any tendency to tip-stall, but I don't recommend tight turns into final. Be careful to keep the wings level during the landing, as catching a wingtip could result in damage to the fuselage.

• Flight characteristics

Once the model is up and "on the step," it flies very well, with no tendency to snap. I have the most fun flying it in close and doing low passes down the runway. It flies very well at about 2/3 throttle, but it's crisp and stable throughout the speed range. Just be careful about getting on the back side of the power curve, as you don't have unlimited thrust.

• Aerobatics

With the model properly trimmed out, loops and rolls are nice, if not dazzling. With a model of this kind, you can't expect to do impressive snaps and spins, but it certainly flies as a Hellcat should. Even with a dive into the maneuver, Immelmans are tough to do, but split-S's look great. When you make low passes down the runway, you're sure to hear some admiring comments from the pits, especially since there's no noisy engine to drown them out!

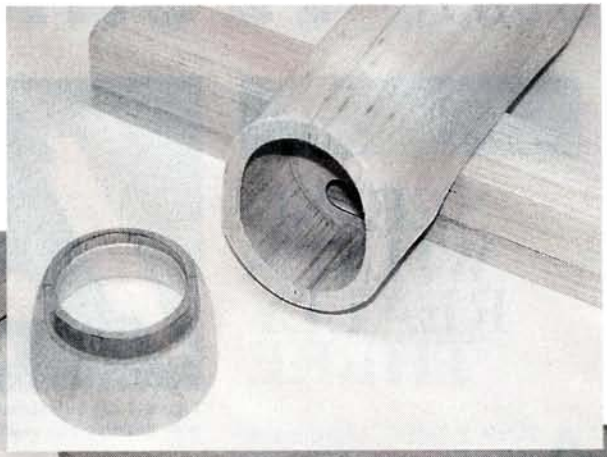
the bottom of the wing, being careful not to glue them to the fuselage. Install the 3/16-inch balsa keel stringer.

Remove the wing from the fuselage, and install the 1/32-inch belly pan sheeting. As with the lower fuselage, carefully trim the sheets so that they join tightly over the 3/16-inch keel. Trim and sand the front and rear edges flush with the formers. Cut an access hole over the wing hold-down screw and reinstall the wing on the fuselage. Sand the joint between the belly pan and fuselage sheeting flush.

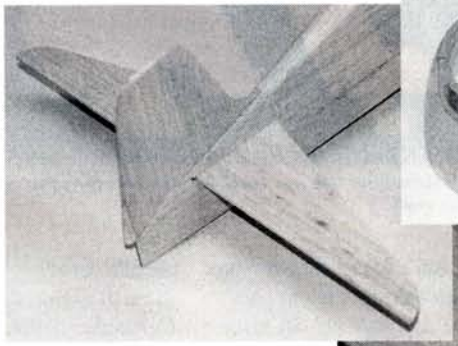
Last details: install the mounts for the aileron and elevator servos. Also install the battery mounting plate on F-3 and F-4. Unless you wish to test fly the model before painting it, I suggest that you leave the installation of the control linkages until the model is finished.

Finishing: unless you're experienced with lightweight covering and painting techniques, I recommend film covering. After covering the model with dark blue film, apply the national insignia and ID markings with white film—a quick and very scale finish.

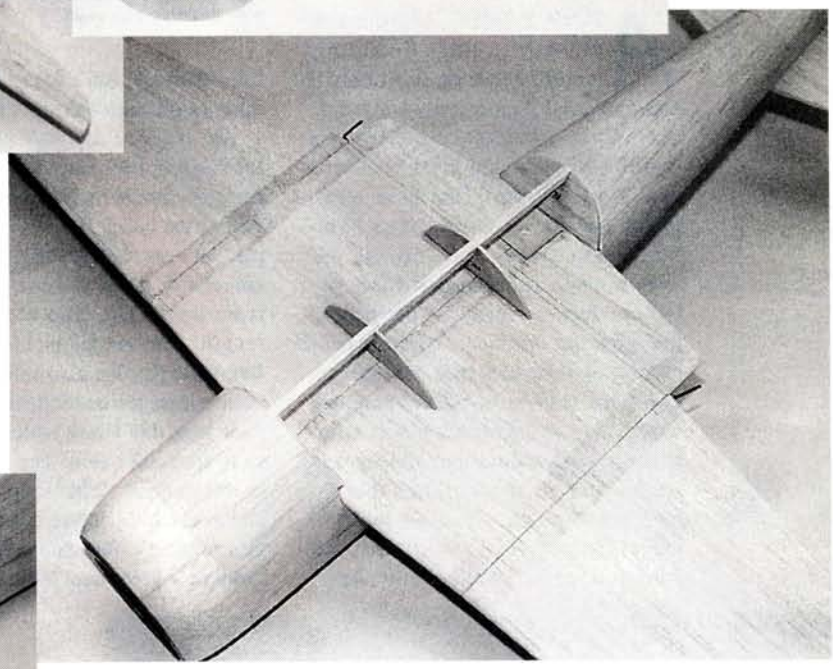
If you do opt to cover the model with fiberglass or another paintable surface, keep weight to an absolute minimum. Use nothing heavier than .56-ounce cloth, and apply it with a single coat of finishing epoxy thinned with denatured alcohol. Also use a light paint. I've found the Floquil* military paints nearly ideal for these small electric projects; they're opaque and very light.



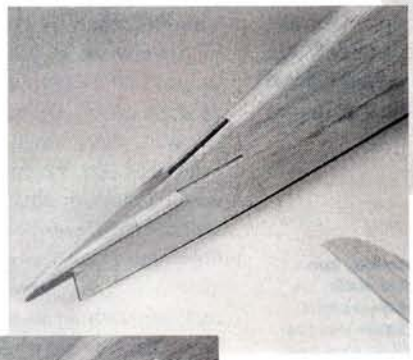
Left: before gluing on the cowl block, cut out the middle of F-2. Note the cross-grain stop-ring that has already been installed in the cowl. The plywood motor mount will rest against this stop.



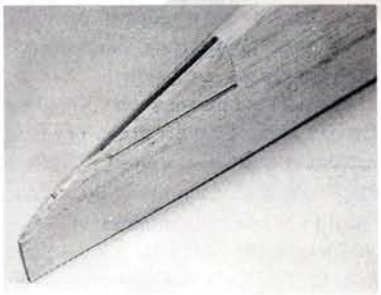
Above: the fin and stab are shown dry-fitted into place. I recommend that you wait until the airframe has been covered before you glue them into place.



Above: with the wing installed, the belly-pan formers are glued into place and the 3/16-inch keel stringer is fitted. The wing is then removed and the 1/32-inch belly pan sheeting is installed.



Right: an 1/8-inch T-shaped spacer is used to support the tail fillets while they're being carved to shape. It's shown here being removed. Be careful not to glue the spacer into place.



Left: small pieces of 1/8-inch balsa are fitted to support the rear of the tail fillets. Make sure you leave room for both the stab and the elevator joiner.

The canopy framing can be painted easily using the computer-generated masks shown on the plans. Copy the masks to artist's frisket film, cut them out, and stick them onto the canopy. After painting the framing, remove the masks and glue the canopy into place. Install the hardware, and you're ready to fly.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

Tipping the scales at just 4.6 ounces, the bare airframe is ready for covering. With the canopy, pushrods, etc., installed, the film-covered airframe weighed 6.4 ounces, while the glassed and painted prototype weighed 7.5 ounces.

Scale TECHNIQUES

by BOB UNDERWOOD

SEEING WHAT'S REALLY THERE

Figure 1. ***Do you remember this eye test? See the text for other ways your eyes can fool you. What do you see?***

A FUNNY THING happened on the way to the column this month. I had an operation! I had a cataract removed from my right eye. What a revelation! There's a world out there that is not covered with a muddy film! That little, clear, plastic lens they inserted allows beautiful blue skies and crisp reds and yellows to once again appear! Since my left eye has a somewhat "unripened" one growing within it, I find myself closing first one eye, then the other, to compare this new polychromatic world. And so this column was born! It deals with colors and shapes and angles and all those things that go bump in the night when we build or judge scale models. In short, what you think you see isn't what's really there!

This month, Bob uses his scale Hiperbipe to illustrate some unusual situations that can pop up during static judging. Here, Bob displays his model for the static judges at the 1996 Top Gun invitational.

CORRECT COLORS

Let's take color first. We all know how difficult it is to truly match them under the best of conditions. Let's take a contest judging session for your brand-new, sport-scale Widget 10, and the three static judges are considering "color, finish and markings." What do they see? Well, as he looks through his cataracts, judge one sees your blue as grayish. Because he has a degree of colorblindness, judge two sees your reds as something else. Judge three, with his youthful, clear eyes, can't figure out why the other judges aren't seeing what he sees!

Ah, but you say they are all three looking at the same color chip, so each one should register a correct rendition of the color. But it's not that simple. All eyes register differences in colors relative to the distance the object is from them. The chip is at an arm's length. The model is 15 feet away. Interestingly, we also note that most static judges are comfortably shaded for their long day's task under a tent, and so is your color chip! The model is out in the sunlight. What color is the tent under which the judges are seated? Are they judging a blue chip in light filtered through a green tent? What if one of those judges is also wearing sunglasses?

Sometimes, our models are static-judged indoors. This is often interesting, especially if the room is lit with certain types of vapor lamps. At a Nats years ago, we used a military hangar that had (I believe) sodium vapor lighting. It was very bright, but any yellow color turned a sickly green. Again, I hear you saying, "But the chip turned the same hue." Maybe, but probably not. Please bear in mind that there is a psychological factor involved as well. We almost always have a preconceived idea of what the color should be. Certainly, if the documentation says "blue," we expect "blue." For instance, doesn't everybody know what Cub yellow looks like? So when the blues are grayish for our cataract-plagued judge or the reds are gray for our "colorblind" members, it's hard to get a clear handle on what is really being viewed.

OTHER CONSIDERATIONS

The sun's position and the angle at which the light reflects off its surface can affect the way your model's color is perceived. Is your model being judged in the early morning, or judged at high noon? Or was it late in the evening? How about your color presentation? Are the color chips mounted on a black or white background? It makes a difference. Did you use a color chart that has a variety of reds all in a row and simply mark the correct one with an arrow? Think about how hard it is for a judge to mentally select your appropriate shade of red from among the many others.

Consider the modeler who is reading this and says, "I have it made! My next subject is black [or white!]. That's a snap"! Wrong! Been there, done that! For a fact, I knew a modeler who figured he couldn't miss. He got the paint from the builder of the full-size aircraft he was modeling. Then, to really cop his bet, he cheated and sprayed his own color chips for the presentation. He never could figure out why when you stood 15 feet away from his model, the color chip looked different than his model. Perhaps it was the color of the paper his chips were mounted on that had something to do with it. Or was it because he used a totally different color primer under his paint than was used

on the full-scale aircraft? Most fabric-covered aircraft have a silver undercoat to protect the fabric covering from UV damage. Take the same final-color paint and spray it over gray or white, and it won't look the same as the full-size aircraft with the silver undercoat. The best thing you can do is judge for yourself before a contest. Place your model 15 feet away and check how it looks compared to your color chips. Do you need to add a little white or black? If you see a difference, so will the judges.

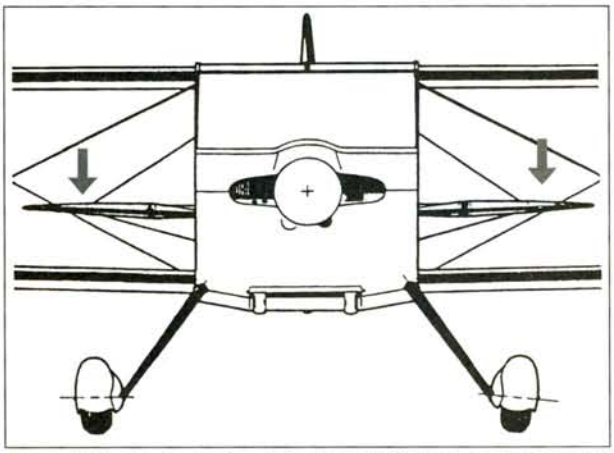


Figure 3. ***In this front view, it looks as if there is a small amount of dihedral in the horizontal stab. There isn't any, however; the illusion is caused by the negative incidence of the stab and its angled LE.***

THE SHAPE OF THINGS

Shapes are also interesting to consider. Years ago, I used the illustration shown in Figure 1 in my classroom. Standing close in front of a very small group of students (two or three), I'd ask them to read what the card said. Some of my students saw the word plain as day while others saw only a series of weird Rorschach-type white shapes. Telling them to "look harder" didn't help. But what did reveal the mystery was for me to slowly tilt the card so the youngsters viewed it from a different angle. For most, the word suddenly appeared!

Something similar happens to us with 3-views as we view a model. If you place the model on a table (or on the ground), often the judge views it from an oblique angle. And in most cases, the 3-view being used by the judges for comparison is held at a right angle to their eyes. Of course, sometimes, just the reverse is true. The model is at eye level (right angles) and the 3-view is flat on the table and the judge looks at it obliquely. In either case, a somewhat distorted image of the shape or outline is seen. How you hold the model for judging can be a factor as well. In one case, I lost points because the flying wires of my model seemed to exit the fuselage at the wrong place. Actually, they didn't. But because I tilted the aircraft slightly during the judging of its top view, the wires appeared to do so relative to the wing's leading edge.

This concern is further complicated by the fact that 3-views are only two-dimensional. The model is not! I'm certain there have been times you had a great deal of difficulty translating the curving structure of an aircraft simply through the use

of a 3-view. The person who drew it had the same problem—and the 3-view may not have been done correctly! If we have a good variety of photos, often we can work out the problems. If the shape of things isn't obvious on the your 3-views, use photos in your documentation to show those shapes to your scale judge.

Lastly ... lines! I've provided three pieces of my Hiperbipe 3-view to illustrate an

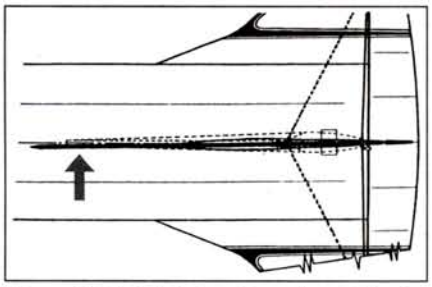


Figure 2. What is being shown here? It's the aft top view of Bob's Hiperbipe. What it shows is the offset of the vertical stabilizer.

important point. If you look at the portion that shows the vertical fin projecting above the fuselage (Figure 2), it appears to have a somewhat thick, tapered section. This is, of course, typical for most aircraft. But in reality, what the draftsman was attempting to show was that the fin is offset 3 degrees to the left of the fuselage centerline.

Also in the front view (Figure 3), the stab's leading edge angle downward causes the appearance of a slight amount of

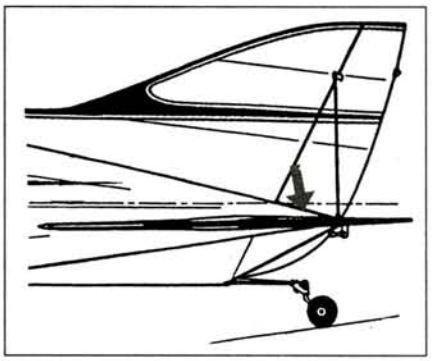


Figure 4. In this side view, you can see the negative-incidence stab angle. The side view also confirms that there is no dihedral in the horizontal stab.

dihedral in the stab. There isn't any, however. What the draftsman was showing was the negative incidence in the stab. The very long sweep of the stab where it meets the fuselage only serves to accentuate this appearance. See the side view (Figure 4).

So-o-o. What have we concluded in this article? Perhaps we should only use young women to judge. Make that young women who are artists or mechanical "draftpersons." (Remember, "colorblindness" is more of a male thing.) I realize that there are few serious answers given here. Rather, what I think we need to do is to internalize the problems that are inherent in creating or judging the "perfect" model. As builders, we must work diligently to provide as much help as we can to the judges. Indeed, they have a formidable task in trying to interpret our efforts in the meager time allowed. In like manner, judges must strive to understand their limitations, if they exist, and focus on the major issues at hand. As a builder/flyer, help the judges to score your model properly by pointing out any peculiarities. To illustrate, the three examples from the Hiperbipe (shown here) were minor downgrades at an event the first year I campaigned the model there. The next year it went to the event, I made my clarifications to these areas graphically and verbally. Did it make a difference? You betcha!

Oh yes, if you still haven't read the word in the eye test, it's FLY. ✈

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

MOST FIXED-WING pilots think that all helicopters are complicated, hard to set up and expensive, and until recently, this was true. With the Revolution* HoverStar, this is no longer true. The HoverStar is a fixed-pitch, simple to build heli that was designed to use standard airplane engines. Also, since there is no collective-pitch rotor head, any 4-channel airplane radio can be used. Simply put, the HoverStar makes it easy and affordable for the entry-level heli pilot to get started.

Revolution HoverStar

by STAFF

An inexpensive, first-step heli

PHOTOS BY WALTER SIDAS

SPECIFICATIONS

Model name: HoverStar

Type: helicopter (fixed-pitch rotor)

Manufacturer: Revolution

Distributor: Horizon Hobby Distributors

Rotor span: 42 in.

Length: 43 in.

Weight: 7 lb., 4 oz.

Engine req'd: .40 to .46 ball-bearing 2-stroke

Engine used: Magnum* .46 w/ball bearings

Radio req'd: 4-channel (cyclic, tail rotor—gyro req'd.—throttle, aileron)

Radio used: JR F400 with four 507 servos

Gyro used: JR NEJ-120S

List price: $250

Features: flight-training video; HoverGuard training gear; composite frame; ball-bearing-supported controls; steel clutch; smoked Lexan canopy; all hardware included; pre-assembled tail boom, tail gearbox and clutch bell; comprehensive instruction manual.

Comments: I found the HoverStar easy to build; when I had a question concerning construction, JR quickly provided the answer. For the first-time heli builder and flyer, the included flight-training video provides great information.

Hits

- Short building and setup time.
- Informative video on setting up and flying.
- Costs less than a collective-equipped heli.
- Uses a standard airplane radio and engine.

Misses

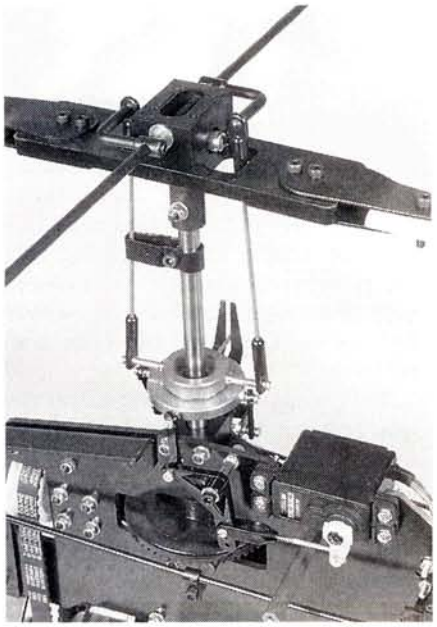
- Needs more clearance between the tops of the landing gear for engaging starter cone. *[Editor's note: Horizon has an optional "Easy Start" starting cone, part no. RV2061 ($8.95), which eliminates this problem.]*

ASSEMBLY

The HoverStar was designed around a single composite mainframe plate to which everything else is attached. The instructions are very concise and go step by step so there's very little confusion. Construction begins by installing the flywheel, clutch and starter cone on your engine and then bolting the engine to the mount plate. Next, the landing gear is attached to the main frame, followed by the tail-boom mount plate. Note that you have to place the drive belt over the rear portion of the main frame before bolting the tail-mount plate into place.

The next subassembly to add is the drive system, consisting of the main shaft and drive gear, spacers and two bearing blocks. The main shaft assembly and the intermediate drive-shaft assembly are then positioned and held in place by the frame doubler plate. Installing the swashplate locating bracket, canopy mount stud and standoffs and the tail-control-rod standoffs completes the basic frame.

When installing the engine and engine-mount plate, it is important that the clutch-bell drive pulley, drive belt and intermediate shaft-drive pulley be in proper alignment. Depending on the length of the engine used, the mount plate



The main shaft showing the rotor head assembly, the flybar and blade attachment mounts, swashplate, flybar control linkage, and roll-cyclic servo and L-arm lever.

can be slid forward or aft until the assemblies line up. Proper drive-system alignment prevents vibration and excess belt wear.

The control-level assembly is next, followed by the swashplate. Install all the ball links and spacers for the L-arm and the T-arm, and use a small drop of CA on the ends of the threads to secure the nuts. Don't use thread-locking compound; it can damage the plastic L-arm level. When installing the swashplate, lightly oil the center O-ring and be careful not to damage it during installation.

Follow the instructions carefully for the main rotor head and the tail rotor. There are a lot of small parts, and everything should operate smoothly. Pay close attention to the main-rotor flybar; if it is not centered precisely, it will throw the balance of the rotor head off and cause vibration.

The tail-rotor gearbox comes already assembled and is held in place with a clamp. Install the tail drive shaft and apply a light coat of oil to the shaft before installing the gearbox. Make sure that one of the two gearbox setscrews seats properly against the flat spot ground on the end of the drive shaft; use thread-locking compound. Install the tail boom

HOVERSTAR RACING

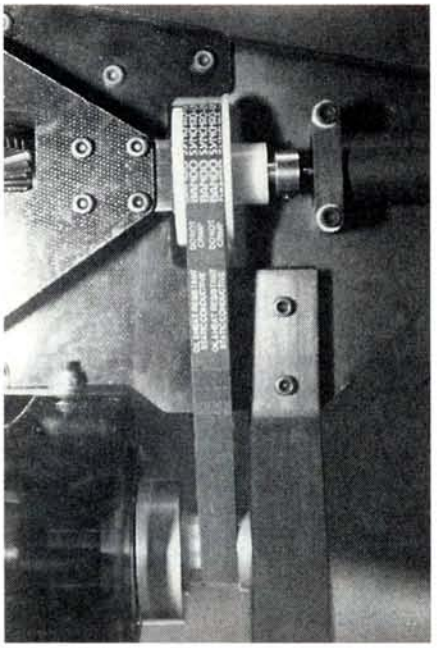
The 1996 Heli-Internationals at the R/C Aviation Country Club in rural Hebron, OH, saw some of the world's best heli flyers come together for fun, competition and information. Famous flyers like Curtis Youngblood, Cliff Hiatt, Dave Storey, Wayne Mann, Gary Wright and many others made this a truly world-class event. In fact, flyers came from all over the world—from Scotland, Japan, Canada, England and more. All weekend, competitions were held for speed runs, vertical drag racing, various precision flying maneuvers and pylon racing.

PHOTOS BY MATT GILMORE

Scott Grey accepts his award for winning the HoverStar pylon racing event.

Yes, I said pylon racing. This annual event saw the development of Revolution HoverStar class pylon racing. Canadian flyer and Team JR member Steve Grey won the final heat, flying the actual HoverStar that's pictured on the product's box. Fellow Team JR member Dave Storey (of "Ergobatic" fame) took second place, while Chuck Wildey came in third. Judging by the audience's reaction to the racing, this is a side of helicopters that folks want more of. Due to their low cost, low parts count and 4-channel system requirement, the stock HoverStar offers many advantages to heli pilots wanting to circle the pylons in search of trophies. During the awards presentation, IRCHA president Shaun Ettinger told the crowd that due to its obvious popularity, HoverStar pylon racing will definitely be included in the 1997 Heli-Internationals as well.

2nd place winner Dave Storey with his pylon machine.



Keeping the clutch pulley, drive belt and intermediate drive pulley in alignment is very important for reducing vibration and drive-belt wear.

and bolt the mount brackets against the mount plate. Attach the drive shaft to the intermediate drive pulley.

ROTOR BLADES

Cover the main rotor blades with the supplied stick-on vinyl covering material. The exposed wood of the blades must be sealed using fuelproof dope or by saturating the areas with thin CA. Then bolt the attachment mounts to the blades and attach the blades to the rotor head. Use a straightedge to make sure the rotor blades are straight and parallel with the main rotor-head center body.

FLIGHT PERFORMANCE

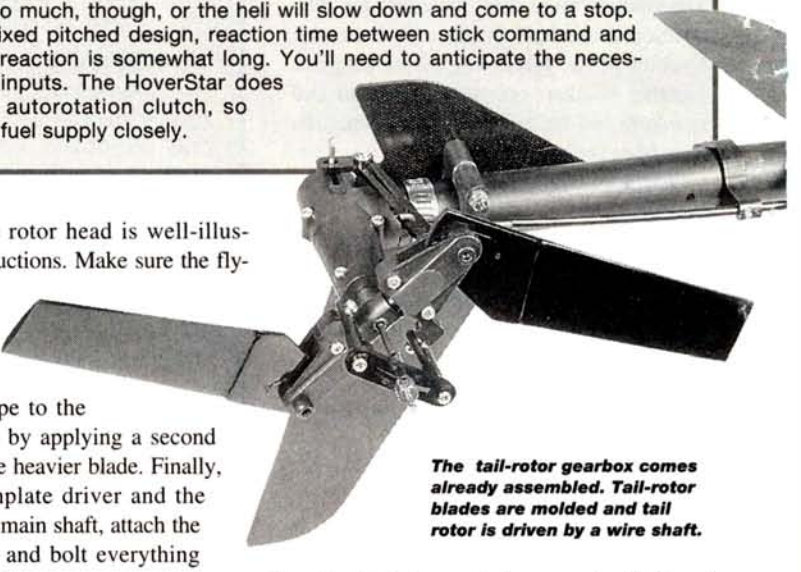
Before flying, check the CG. Lift the HoverStar by the flybar while the rotor blades are pointing forward and aft. The heli should maintain a level attitude. If it doesn't, add weight to the nose to correct. Double-check all the screws, nuts, bolts, pushrods, etc., and you're ready for the flying field. If this is your first helicopter, find an instructor and attach the HoverGuard training gear; the blades you save may be your own.

Set the engine idle and check the rotor-blade tracking. For your first flights, use a large paved parking lot so the heli can skid around and not be tripped by tall grass. The manual recommends the gyro gain be set at 75 percent, but I found this was too sensitive; 60 percent was about right to prevent the tail from swinging as power was applied. With the HoverStar trimmed properly, it will lift off straight up, without drifting off point.

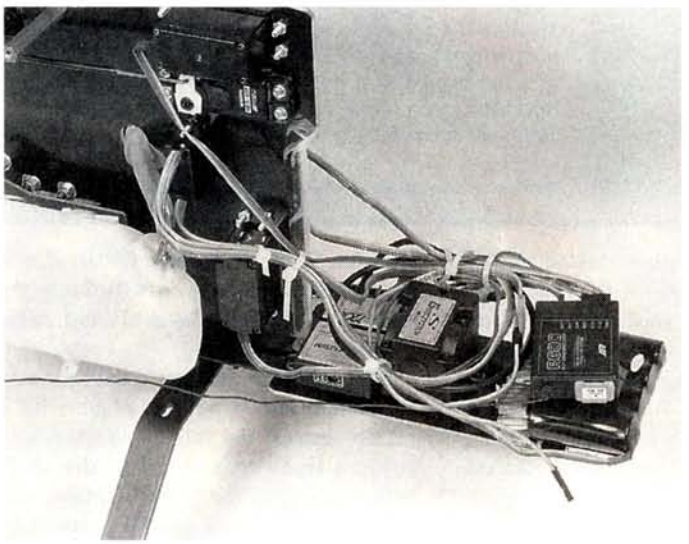
Throttle management is the key to proper takeoff and landing, and the HoverGuard gear helps a lot in preventing the model from tipping over. The rotor becomes more efficient when out of ground effect (about a rotor span above the ground), and slightly less throttle is required to sustain hover. Go easy with the throttle adjustments.

The HoverStar transitions nicely into forward flight, and while in forward flight, feels much like a sport plane. Turning and banking require both aileron (roll cyclic) and rudder (yaw) control and a small amount of up elevator (pitch cyclic) input—not too much, though, or the heli will slow down and come to a stop. Since it's a fixed pitched design, reaction time between stick command and rotor blades reaction is somewhat long. You'll need to anticipate the necessary control inputs. The HoverStar does not have an autorotation clutch, so monitor your fuel supply closely.

Balancing the rotor head is well-illustrated in the instructions. Make sure the flybar is level, and adjust the rotor-head balance by adding the rotor tracking tape to the blades. Fine-tune by applying a second strip of tape to the heavier blade. Finally, install the swashplate driver and the rotor head on the main shaft, attach the tail-rotor blades, and bolt everything securely into place.



The tail-rotor gearbox comes already assembled. Tail-rotor blades are molded and tail rotor is driven by a wire shaft.



The radio system including RX, battery pack and gyro is attached to the canopy floor with double-sided tape. Adding weight or a larger battery pack to the canopy floor will correct any tail-heavy CG problems.

RADIO AND FINAL ASSEMBLY

For control, a JR* F-400 and four NES-507 servos work well in the HoverStar. An NEJ-120S gyro was also used. Install the pushrod and drive rods, but make sure the servo arms are centered before you do the final length adjustments.

Install the fuel tank and muffler, and make sure that the fuel lines and the servo leads do not come into contact with any moving parts. Use tie-wraps to secure any loose connections. Install the tail-rotor pushrod, paint the fins to your liking, and attach them to the tail boom.

The canopy comes in two halves that must be trimmed to size and glued together. Use clothespins to hold the canopy halves together until the adhesive has dried. Paint the canopy and apply the decals, then attach the canopy to the standoffs to finish the job.

CONCLUSION

The HoverStar is an affordable, fairly easy to build project for the entry-level heli pilot. Parts are readily available, and its simple design makes repairs easy. If you want to get to the heli pad quickly, the HoverStar is a fast ticket.

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

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You're probably not aware that most of SR's business is in the military/aerospace industry. Our customers include NASA, Lockheed, Boeing, the Army, Navy, Marines and Air Force, the Jet Propulsion Laboratory, The Hubble Space Telescope, the Space Shuttle Program, the Mayo Clinic, Johns Hopkins University, AeroVironment, and the Harris Corp. to name just a few.

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- All SR cells are *screened and matched Aerospace Grade* cells. These are not your usual consumer type inexpensive cells. They are exactly the same cells we use for our military/aerospace applications.
- Only SR *guarantees* its cells and packs not to *ever* form a memory and warranties each pack for one year.
- Only SR puts *every* pack through five days of electronic testing to make sure *every* pack is perfect. These tests include a test of capacity, charge retention, and a vibration test for mechanical integrity.
- All *welded* internal and external construction. Would you believe that some companies sell cells where the internal connections are nothing more than a press fit? We don't even have soldered connections, except for the connector leads themselves.
- Even the straps we weld from one cell to another are an SR exclusive. Each strap is strain relieved so that no vibration or stress is transmitted to the welds at the end of each cell. No one else has this feature!
- All SR packs can be fast charged. Of course no cell will stand up to extreme overcharging but all SR cells have the lowest possible internal impedance so that fast charging isn't a problem.
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- Did you ever try calling the "other guys" with a technical question? Did anyone there have any idea of what you were talking about? Only SR maintains a *Hotline* phone number, 516-286-0079, where you can call for help with *any* R/C problem or question, battery related or not!

Using SR packs, thousands of contests have been won, national and world records set, and national championships awarded to modelers around the world. A short list of just some of our customers would include: Bob Aberle, Joe Bridi, Dave Brown, Byron Originals, Hal DeBolt, Bob Dodgson, Dr. Walt Good, Robert Gorham, Dick Kidd, Ivan Kristensen, Don Lowe, Eloy Marez, George Myers, Dean Pappas, Dave Platt, Nick Ziroli, etc., etc.!

If you'd like more information or have a question, drop us a note at SR Batteries, Inc., Box 287, Bellport, NY 11713, Fax: 516-286-0901, Email: 74167.751@compuserve.com or call 516-286-0079 between 9am and 5pm Monday through Friday, Eastern Standard Time.

-ADVERTISEMENT-

Scratch-Builders' CORNER

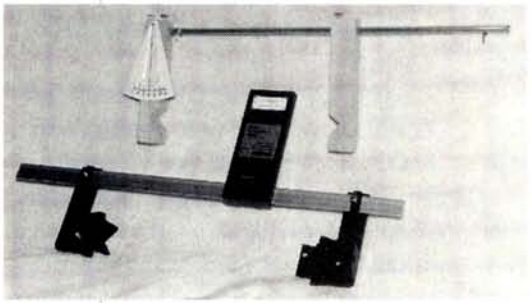
by GEORGE WILSON JR.

GET IT STRAIGHT!

WHETHER YOU'RE a kit builder or a scratch-builder, your model has to be balanced and aligned as the plan calls for if the model is to fly well. At a recent Discover Flying R/C Club presentation, Mario Borgatti discussed the importance of aligning and balancing models. This month, with Mario's permission, I've borrowed some of the aligning techniques he discussed to share with you.

NECESSARY TOOLS

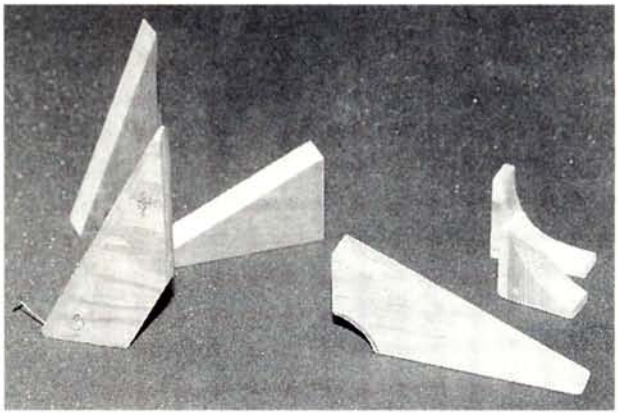
Alignment tools can be inexpensive, but they produce accurate results. Alignment involves angles—mostly right angles that can be measured using drafting or carpenter's triangles; for best accuracy, use the largest one available. Other angles are measured using protractors or incidence meters. Incidence meters are used to set wing and stabilizer (stab) incidences, which are the angles of the wing and stab with respect to the model's horizontal reference line. Randy Randolph discusses how to build an incidence meter in his book, "R/C Airplane Building Techniques" (published by Air Age Inc.).



Here are scratch-built and commercial (Robart®) incidence meters. This device allows precise setting of the wing and stab incidences.

Levels are used in many phases of aligning and balancing models. Line levels and surface levels cost around $2. A plastic 360-degree dial level costs less than $10, can be compared with a good carpenter's level and can be sanded to improve its accuracy if necessary.

A level stand is a piece of ¼x½-inch medium or hard strip balsa that's mounted vertically on about a 3-inch-square base. It's used to elevate the aft end of the fuselage while you set the incidence angles.



Several scratch-made alignment triangles are shown here. Figure 1 explains how to make them. Commercial versions of this sort of triangle are also available. The missing corner is very useful when you're setting a fin at a right angle to the stab.

PHOTOS BY RICHARD MACDONALD

You can easily make handy triangle tools for setting the fin's angle with respect to the stab (see Figure 1). These tools can also be used to square bulkheads, fuselage sides, ribs, etc., and you can mount fins using the triangle tools that don't have right-angle corners.

ALIGNING THE WING

First, transfer the fuselage horizontal reference line from the plan onto both sides of the fuselage. To avoid denting the wood, use a very soft pencil, or mark the line with masking tape. Next, mark the fuselage centerline (CL) on the top and bottom. The line should go between the centers of the firewall and the tail post. Use a good straightedge, and ignore the bulkhead center marks; they should be very close to the CLs just marked.

The wing(s) must be at right angles (perpendicular) to the fuselage CL and at the correct incidence angle. Although rubber bands work well and are a time-honored means of attaching wings on trainer and sport models, I recommend that you slightly modify your model to use bolts instead.

The bolt-on system uses one or two dowels in the LE that mate with holes in a piece of plywood in the fuselage. You may not be able to mount the front dowel(s) in the wing's LE of some models, such as those with high wings. Instead, a dowel mount can be built under the wing as was done on the Live Wire Champion shown in the photo (top of next page). I've also modified a Lazy Bee this way; both models fly well.

At the TE, the wing is secured with two nylon bolts (one on very small models) that should shear off in a crash. My .40-size and smaller models use 10-32 or smaller bolts in contrast to the ¼-20 used most often. Even my

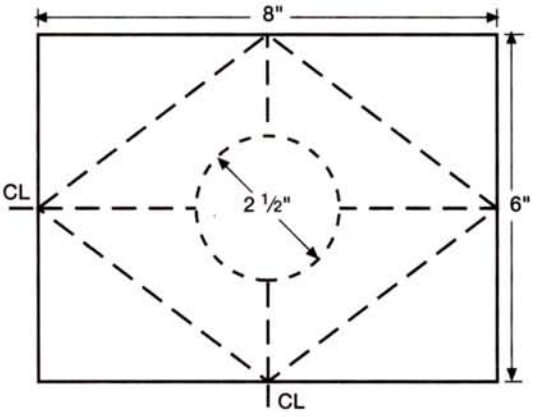
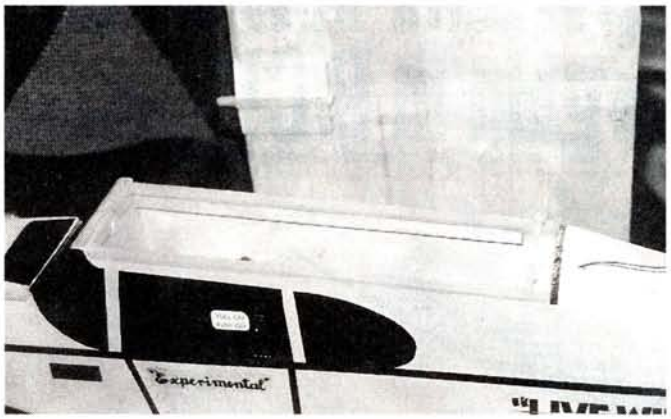
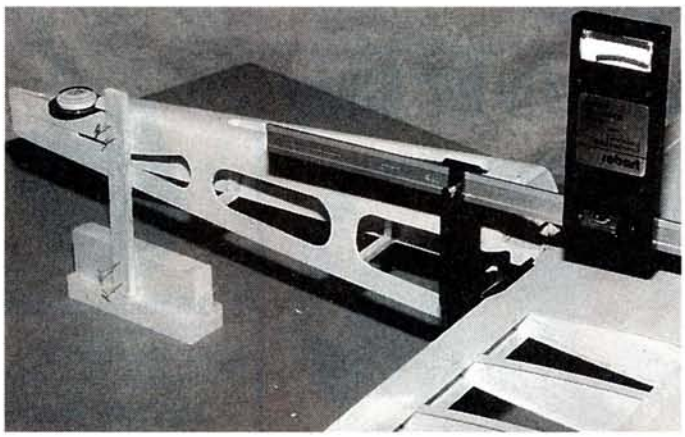


Figure 1. ***Eight handy triangles can be cut out of a 6x8-inch (or larger) piece of ¾-inch-thick wood. First, mark the centerlines, then cut a round hole in the center (the exact size isn't important). The missing corners in the four center squares fit around the fuselage when the square is next to the fin. Next, cut along the centerlines, and cut along the diagonals. Check the triangles out with a reliable square, sand them, and coat them with shellac, dope, or a similar sealer.***



The bolt-on wing modification on a recently built Live Wire Champion. Note the dowel mount installed under the LE of the wing. The hold-down bolts are 10-32 nylon. They're strong but should shear off in a crash to reduce overall damage.



An incidence meter is used to set the wing incidence. The angle is taken from the plan. The incidence meter automatically sets itself to the wing's reference line (the mean chord) from the LE to TE.

10-32 bolts have survived crashes that would have been much less destructive had the bolts broken. The alignment instructions that follow assume that you use bolts—not rubber bands—to attach your model's wings.

To set the wing incidence, first find which incidence is called for on the plan. The angular setting should be shown; if it isn't, draw a line on the plan that connects the center of the TE and the most forward point of the LE. This is the usual reference for setting wing incidence. An incidence meter will automatically select this line as the wing's reference line. Using a protractor, measure the (incidence) angle with respect to the fuselage reference line. Put the LE dowel(s) into its socket, and pin the wing in place. Be sure the wing is at a right angle to the fuselage CL (an eyeball check is sufficient). Set the airplane on a level work surface, and raise the aft end using a level stand. When the reference line on the fuselage is level, pin the tail of the plane into place on the level stand. Install the incidence meter on the center of the wing, and check the wing's incidence.

If the angle isn't correct, adjust the wing saddle as necessary, and make sure that the fuselage is upright and doesn't lean sideways. Use a bubble level across the fuselage to check that the wing is horizontal.

Now make sure that the wing is perpendicular to the fuselage CL. Using a straight piece of 1/4-inch-square balsa pinned to the center of the tail post, mark the distance to a point on one TE near the wingtip. Swing the strip to the same point on the other TE, and determine whether the distances are equal. Move the wing until both distances are equal, then pin the wing firmly in place.

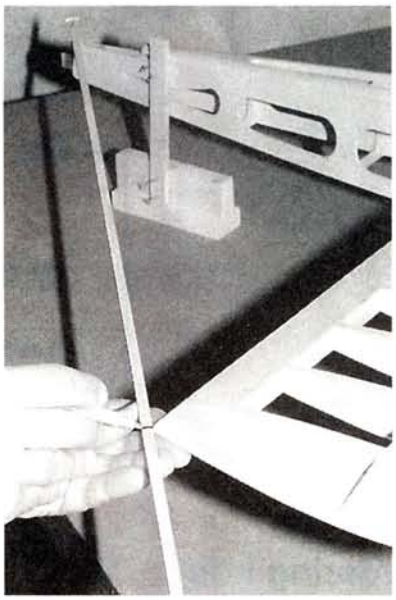
The next step is to make the wing hold-down bolt holes. I'll assume that you've already firmly mounted a 3/16- or 1/4-inch piece of aircraft plywood in the fuselage to receive the bolts. Mark the hole positions on the wing, and drill through the wing perpendicular to the wing's surface and on through into the plywood in the fuselage. Repeat on the other side. The drill should be the bolt's tap drill size: no. 29 (9/64 inch) for 8-32, no. 21 (5/32 inch) for 10-32 and no. 7 (13/64 inch) for 1/4-20. Saturate the holes with thin CA. Tap the holes in the plywood, and enlarge the holes in the wing to accept the bolts using no. 18 (11/64 inch) for 8-32, no. 9 (3/16 inch) for 10-32 and 1/4 inch for 1/4-20. Re-saturate the holes with CA, and re-drill and re-tap to remove any excess CA. Install the bolts with washers under their heads. The wing now has the correct incidence angle and is at a right angle to the fuselage CL.

ALIGNING THE STAB AND FIN

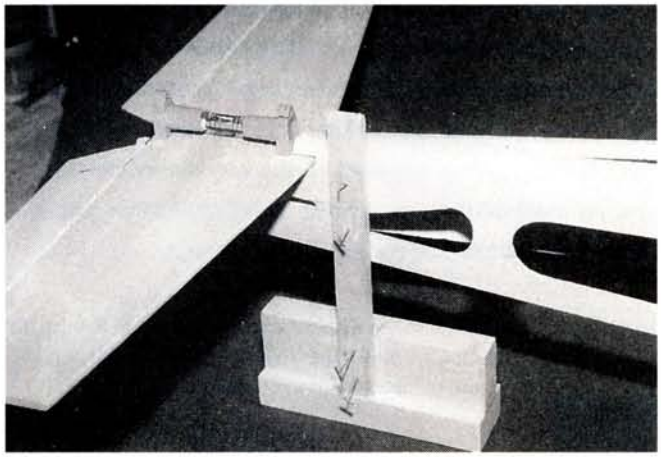
Aligning the stab is essentially the same procedure as used for the wing. First, ensure that the incidence angle is correct and, using a bubble level, that the stabilizer saddle is horizontal. Most often, the stab is on or parallel to the horizontal reference line. Shim or trim as necessary. Use an incidence meter if the stab is not supposed to be parallel to the reference line.

Pin the stab in place. Set it at right angles to the fuselage CL as you did the wing using a point on the fuselage CL as far forward as practical as the reference and points on the LE tips as the measuring points.

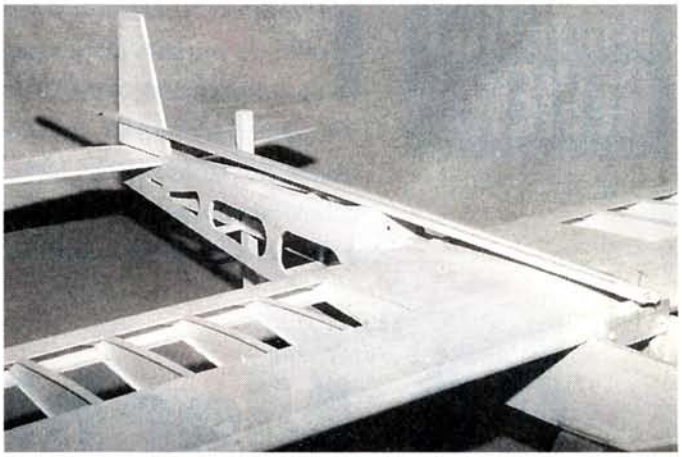
The stab can now be covered and glued into place. To ensure a strong glue joint, remove the covering where the stab and fuselage will be joined. Here's a tip: *before* you cover the model, outline the areas you don't want to be covered with masking tape. Then cover the top and bottom—including the masked areas. Slit the covering at the edge of the masking tape and peel off the tape—neat and easy! Using this



The wing is aligned to be at a right angle to the fuselage CL. Using long pieces of strip wood and measuring to the wingtip ensures accuracy.



Setting the stab incidence and aligning it with the fuselage. Usually, the stab is on the horizontal reference line or parallel to it; the incidence meter is not needed in this case.



The fin is easily centered using two long, straight balsa strips that tie its alignment to a point as far forward on the fuselage CL as possible.

method, you can also allow for the triangular fillets frequently used between the stab and fin and the fuselage.

The fin must be on the fuselage CL and be at a right angle to the stab. First, trial-fit the fin, and sand as necessary to make it fit well. Pin it in place on the CL at the tail post. Pin the ends of two long, straight pieces of ¼-inch-square balsa on each side of the fin. Bring the other ends together on the fuselage CL as far forward as possible. Now pin the front of the fin in place, and make a line on the center of the fin's LE and the fuselage. The mark on the fuselage should be on the CL.

ENGINE THRUST

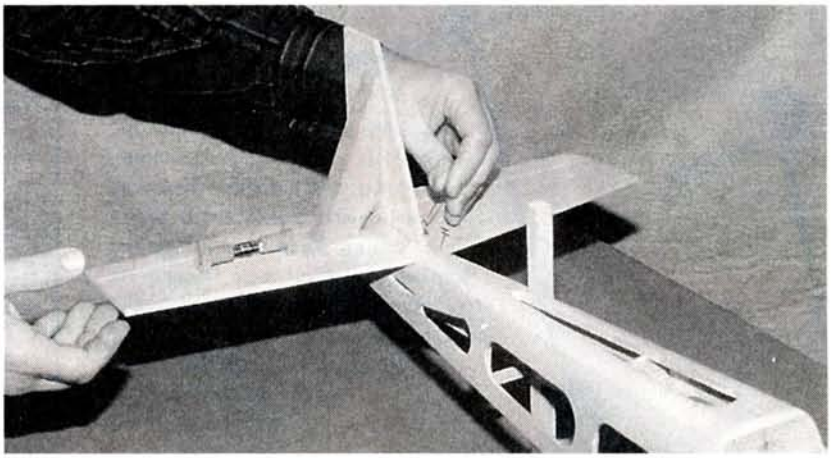
Many plans call for the engine thrust line (the angle of the propeller shaft) to be offset. Most often, the propeller (shaft) will point down (to offset increased lift at higher speeds) and to the right (to offset the propeller's "torque"). (The term "torque" is not strictly correct in this case, but suffice to say, most models tend to turn left without the addition of right thrust.)

If you use an engine mount that's attached to the firewall, the thrust line adjustment is best made with a hardwood shim or washers between the mount and the firewall. If the engine is mounted on bearers or on a shear plate on top of the bearers, the downthrust adjustment can be added using washers under the rear engine-mounting tab holes. Right thrust can be achieved by making the mounting-bolt holes a bit oversize and twisting the motor sideways. You can build side thrust into the shear plate when you cut the opening in it for the engine. Be sure to use locknuts on the engine-mounting bolts.

Engine thrust adjustments aren't critical in trainer/sport models; an eyeball check of them using a protractor will usually be sufficient.

FINAL NOTES

The landing gear and wheels should be at right angles to the fuselage. Use the same method as you used to align the wing and stab. To ensure good tracking while taxiing, the wheels should be set at a slight toe-in angle (pointing slightly inward).



The fin is set at a right angle to the stab using a triangle that's missing one corner. This allows the triage to fit around the corner of the fuselage and/or the fillet that may be used between the fin and the stab or fuselage.

The final test of balance and alignment comes during the initial flights. Minor warps and uneven drag (typically because of a muffler) may require you to trim the model's control surfaces. Ideally, for minimum drag, the fin and stab mountings should be adjusted to allow the fin and stab to be in line with the rudder and elevator. This is probably overkill for trainer and sport models, but it's essential for aerobatic models.

CONCLUSION

Don't overdo the accuracy of the incidence and alignment settings; it's OK to need a bit of control trim on trainer and sport models. On aerobatic, pattern and other contest models, however, the total removal of warps and accurate alignment are essential to ensure that the models will fly well at all speeds.

And, as Mario said during his presentation, "If you build it like the plan, it will fly as the original did."

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

MODEL AIRPLANE NEWS

PRODUCT REVIEW

by RICK BELL

IN THE EXCITEMENT of flying the latest masterpiece that you've labored perhaps months over, do you take proper steps to determine its center of gravity (CG)? Most of us usually do a quick check of the CG using our fingertips. If the plane is too large to do this by yourself, you have your wife, girlfriend, flying buddy, or one of your kids help with the task. The results are often less than perfect. The CG has a profound effect on the way the model flies, handles and responds to control inputs. As most of us know, a nose-heavy model flies poorly; a tail-heavy model flies once. Those who do not know this find out the hard way!

Great Planes C.G. Machine

A better way to proper balance

Great Planes* has recognized this problem, and with their C.G. Machine, you can now accurately and easily balance your model according to the manufacturer's recommendations. You can also make precise changes to the CG location to alter your model's flight characteristics to match your skills and preferences.

ASSEMBLY

The machine goes together easily; however, there are a few things to look out for. The instructions direct you to thread the pivot balls into the ¼-inch rods with locking compound. Before doing so, you should just screw them in, snap on the socket caps and check them for freedom of movement. If the sockets are too tight, when the model is placed on the machine, the friction will not allow the model to rock easily, and this will give a false reading. Mine were a little too tight, so I chucked them (loosely by the threads) in a hand drill and used a piece of 600-grit wet or dry sandpaper with light oil to polish them. Next, the two plastic rulers come connected by three tabs. You must carefully cut them apart and trim away the tabs flush with the ruler edge. This is important so the rulers slide easily in the ruler holders. You can then seat the rulers into the endcaps and glue them with thick CA; make sure that the rulers are 90 degrees to the pointers before you do this.

BALANCING

There are two ways to use the machine: balance your model at a predetermined location or measure where your model currently balances. For new, unflown models, the predetermined location method works best. You can balance your model slightly nose-heavy for those first test flights and then go back and move the CG forward or aft to fine-tune the model's feel to your tastes.

• **Predetermined method**. Measure on the plans the distance from the wing's leading edge to the balance point. Spread the width of the uprights to just clear the sides of the fuselage, keeping them as close as possible next to the fuselage. Remember, the CG on the plans is where the wing meets the fuselage. Slide the rulers to the distance measured and place the model on the machine in a level attitude. Pivot the rulers until they are horizontal, then move the model until the wing's leading edge touches the upright pointers. This is the spot where your model should balance. If it is nose- or tail-heavy, move internal components (if possible) to achieve balance.

• **Check where your model balances.** Slide the rulers out to the 7-inch lines. As before, place the

SPECIFICATIONS

Product: C.G. Machine

Manufacturer: Great Planes Model Distributors Co.

Price: $39.99

Comments: the GP C.G. Machine is an easy-to-use tool to accurately balance high-wing, mid-wing and low-wing models. It can accommodate models weighing up to 40 pounds. Good instruction booklet with lots of photos.

Hits
- Easy to assemble/use.
- Accurate.
- Good instructions.
- Accommodates many model types.

Misses
- None noted.

model on the machine in a level attitude, pivot the rulers until they are horizontal, and slide the pointers back to touch the leading edge. Read the distance in both ruler holder windows to find the current CG of the model. If the reading is slightly different between the rulers, use the average of the two values.

Included with the C.G. Machine is a bubble level that can help you accurately determine when the model is level on the machine. You can tape the level to the side of the fuselage relative to a reference line (line must be 0 degrees) or place the level on the stabilizer. Again, the stabilizer must be at 0 degrees. Then make your adjustments to the CG until the bubble is in the center of the level.

RESULTS

To really test the machine, I used an unflown GP Extra 300S that I had recently finished. I balanced the model using my fingertips (the way I usually do), making it slightly nose-heavy. Then I test-flew it a couple of times. The model flew well, but it was sluggish for the type of flying it was designed for. It was also difficult to slow down for landings. Back at the workshop I checked the CG using the C.G. Machine and found that the CG was in front of the recommended CG range, so I moved the battery pack aft a few inches to achieve the desired CG.

The results were amazing! The Extra now performs as I hoped it would—crisp and precise. Landings were also much improved and easier to slow down.

Here's my Extra balancing on the C.G. Machine.

SUMMARY

The GP C.G. Machine is a tool that improves the way we balance our models. You can now have better control over the placement of the CG and remove some of the "pucker factor" of those first flights. It's easy to assemble and easy to use. It is a must-have for any workshop or club. Try one and see!

**Addresses are listed alphabetically in the Index of Manufacturers on page 134.*

LATEST PRODUCT RELEASES

LINCK MODELS

Chips Akro II

This kit features hand-cut machined balsa and lite-ply parts, two sheets of plans, an illustrated construction manual and built-up balsa wheel pants and cowl. It also includes a clear plastic canopy, a hardware package, a glass-filled motor mount, a tailwheel bracket, and wheel-pant mounts. A custom-cut vinyl graphics package is also available. Specifications: wingspan—56 inches; wing area—525 square inches; weight—4.75 to 5.25 pounds; recommended engine—.40 2-stroke or .45 to .50 4-stroke; radio required—4-channel.

Price—$94.95 (plus $5 S&H; MA residents add 5% sales tax).

Linck Models, 141 Moulton Hill Rd., Monson, MA 01057; (413) 267-9545.

REID'S QUALITY MODEL PRODUCTS

Cheetah 42

This 2-stroke engine comes with a CH Electronics Jump Start for safe, easy hand starts. It also features a backplate engine mount and spacer, a chrome-plated cylinder bore, a rear-exhaust muffler and an adjustable velocity stack for clean airflow to the carburetor. It puts out 3hp and weighs 4.5 pounds, and it comes with a two-year warranty.

Price—$319.95 (plus $6 S&H).

Reid's Quality Model Products, 30 Clifton St., Phelps, NY 14532; (315) 548-3779; fax (315) 548-4099; email dreid@epix.net.

PANACHE PRODUCTIONS

"Your First ARF" Video

This 60-minute VHS video covers all the basics of building an ARF kit and answers the most asked questions about R/C flight. It covers the theory of R/C flight, building tips, basic radio installation and setup, engine installation and mounting, suggestions for necessary field equipment and flight training. It is not intended to take the place of an instructor but was designed to supplement an instructor.

Part no.—PCHZ1010;

price—$29.99.

Panache Productions; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008.

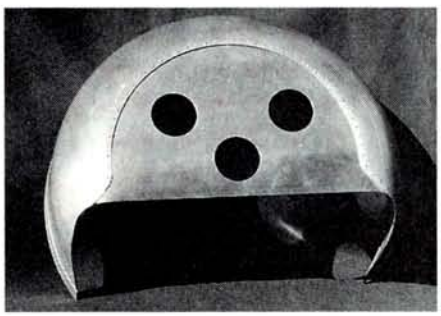
GLENN TORRANCE MODELS

1/4-scale Fokker Cowl

This aluminum two-piece cowl is riveted together (just like that of the full-size plane) and will fit any 1/4-scale Fokker Dr. 1, D-VIII and D-VI model. The kit includes all the hardware (such as rivets, cable, fittings, manufacturing plate and screws) and parts you'll need to create a functional cowl. For additional information, send $1 to Glenn Torrance Models.

Price—$68 (plus $4 S&H).

Glenn Torrance Models, 1258 Dogwood Rd., Snellville, GA 30278; (919) 846-4816; fax (919) 846-7413; email gtm@mindspring.com.



ELECTRODYNAMICS INC.

Onboard Battery Monitor

The EDR onboard battery monitor can be plugged into any spare channel on your receiver or into a Y-harness. A five-LED bar indicates your battery voltage. It weighs less than 1/2 ounce and is available in 4.8V (4-cell) and 6V (5-cell) versions.

Price—$29.95

ElectroDynamics Inc., 31185 Schoolcraft, Livonia, MI 48150; (800) 337-1638 or (313) 422-5420; fax (313) 422-5338.

Product NEWS

AVEOX INC.

Thermal Traveler

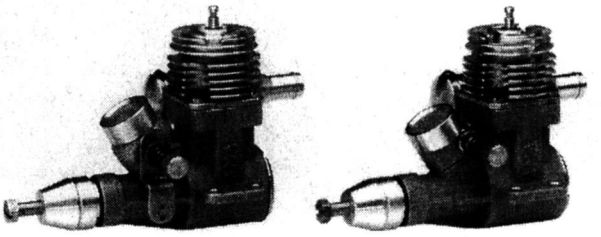
This high-performance, electric-powered glider has a 72-inch wingspan and uses an Eppler 205 airfoil for excellent glide characteristics. All parts are machine-cut, and the kit comes with rolled plans and detailed instructions. Aveox recommend that you power the model with a 1406/3Y motor and 9x5.5 prop on 7 cells. Call Aveox for a free catalogue.

Price—$49.95.

Aveox Inc., 31324 Via Colinas #103, Westlake Village, CA 91362; (818) 597-8915; fax (818) 597-0617; email morme@aveox.com; website http://www.aveox.com.

NORVEL

BigMig Sport and AME High-Performance Engines



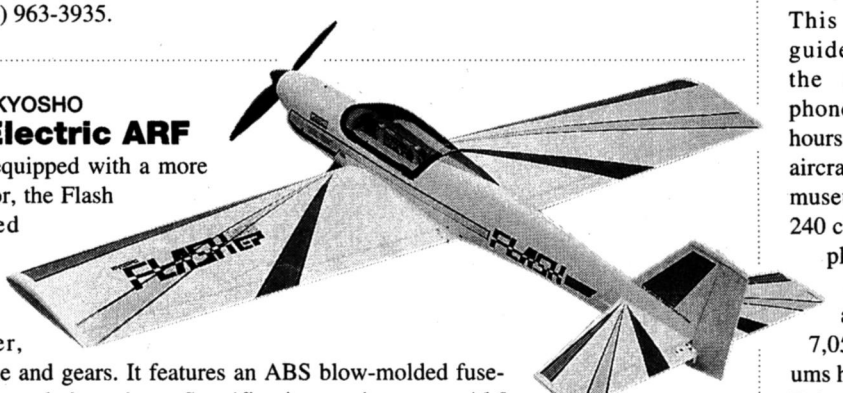
The BigMig Sport .049 and .061 engines are easy to start, quiet and clean. The AME MKIII high-performance .049 and .061 engines are renowned for their impressive power. All Norvel engines feature a real wristpin and connecting rod, standard .049 beam-mount configuration, true carburetion and Schnuerle porting.

Prices—$43 (BigMig Sport .049 and .061), $49 (AME MKIII .049 and .061) plus $4.50 S&H.

Norvel, 2244 E. Enterprise Pky., Twinsburg, OH 44087; (216) 425-3630 or (800) 665-9597; fax (216) 963-3935.

KYOSHO

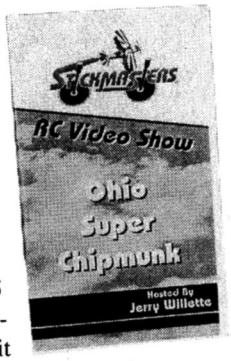
Flash Electric ARF



Updated and equipped with a more powerful motor, the Flash is assembled and covered and comes with a nylon prop, spinner, wheels, linkage and gears. It features an ABS blow-molded fuselage and built-up balsa wings. Specifications: wingspan—46.8 inches; wing area—347 square inches; weight—2.6 pounds; length—34 inches; radio required—4-channel with three miniservos and electronic speed controller.

Part no.—KYOA1210; **price**—$299.99.

Kyosho; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; website http://www.hobbies.net/kyosho.



STICKMASTERS

Video Reviews

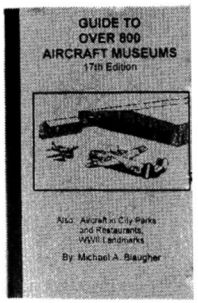
Narrator Jerry Willette reviews some of the most popular kits in videos that show you what's included in the kit box, go through some of the building process, explain radio and engine installation and also show you how the model flies. Videos are available for the Ohio R/C Super Chipmunk, the Midwest Super Stinker, the Sig Spacewalker, the Lanier Laser, the Balsa USA Phaeton 90 and the Aerocraft Staudacher. Each video also comes with coupons and gift certificates or discounts for model airplane fuel, equipment, hardware, etc.

Price—$19.95 (plus S&H).

Stickmasters, RR1, Box 1179, Fort Ann, NY 12827; orders (800) 951-7172; (518) 743-9491; fax (518) 793-3947.

MICHAEL A. BLAUGHER

Guide to Over 800 Aircraft Museums



This 138-page guide contains the addresses, phone numbers, hours, prices of admission and all aircraft on display at 833 aircraft museums in the U.S. It also lists 240 cities that have aircraft on display, 43 restaurants that have aircraft inside or outside and an alphabetical listing of 7,059 aircraft and which museums have each type.

Price—$7 (plus $1.50 S&H, one book); $13 (plus $1.50 S&H, two books); $12 (plus $2 S&H, three books).

Michael A. Blaugher, 124 E. Foster Pky., Ft. Wayne, IN 46808-1730; (219) 744-1020.

CLASSIFIEDS

BUSINESS

SCALE AIRCRAFT DOCUMENTATION and resource guide. Larger, updated 1997 edition. World's largest commercial collection. Over 6,400 different color Foto-Paaks and 35,000 three-view line drawings. 204-page resource guide/catalogue—$8; Canada—$10; foreign—$15. Bob Banka's Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058. [3/98]

ANTIQUE IGNITION—GLOW PARTS CATALOGUE, ½-inch THICK. Timers, needle valves, cylinder heads, pistons, tanks, spark plugs, race car parts. Engines ½A, Baby Cyclone, McCoys, Phantoms, etc. $10 postpaid (U.S.), $20 foreign. Chris Rossbach, 135 Richwood Dr., Box 390, Gloversville, New York 12078. [9/97]

RUSSIAN AVIATION AND SPACE HISTORY. For sale: photographs—color or black & white (any size, available framed or unframed) with original signatures of Russian cosmonauts and without (signatures are original, but reproduction). Envelopes with postage stamp, which put on the Baikonur (Russian Cape Canaveral) with original signatures of Russian cosmonauts and without. Autographs guaranteed genuine. 40-year collection of lapel pins, tie tacks, medals (about 1,700, including rare samples)—Soviet aviation and aerospace. Schemes of airplane models such as LI-2, IL-12, IL-76, IL-114, AN-8, AN-12, AN-22 and some others in a scale of 1/72 with all necessary cross-sections. Excellent handcrafted aircraft models of AN-2 and IL-76 (scale 1/72). Gramophone records with original signatures of Russian cosmonauts (voices of Y. Gagarin, S. Korolev, and K. Tsialkovsky). Consultations about Soviet Union and Russia aircraft and space history. SETNA Consulting Co., 1041 N. Stanley Ave., #6, Los Angeles, CA 90046. Phone/Fax (213) 656-0387. [9/97]

BUILDING SERVICE. Trainers to jets! We build them. You fly them. We are at the leading edge of R/C aircraft assembly technology. (407)359-5387; (407) FLY-JETS. We specialize in trainers, sport, scale, giant scale & jets. www.iag.net/-aircraft, or email aircraft@iag.net. [7/97]

AERO FX BY JO DESIGNS—exact-scale, computer-cut, high-performance vinyl graphics and paint masks. Lettering; nose art; insignia for scale; pattern, pylon and sport fliers; complete graphic sets available. Call or write for free sample and catalogue. JO Designs, Rt. 1, Box 225 AA, Stratford, OK 74872; (405) 759-3333; fax (405) 759-3340. [11/97]

GIANT-SCALE PLANS BY HOSTETLER. Send SASE to Wendell Hostetler's Plans, 1041 Heatherwood B, Orrville, OH 44667. Phone (330) 682-8896; fax (330) 683-5357; http://www.aero-sports.com/whplans [6/98]

SODA-CAN AIRPLANES—replica biplane detail plans with photos $7.50 PPD, Early's Craft, 15069 Valley Blvd. SP 26, Fontana, CA 92335. [8/97]

AFFORDABLE CNC MILL. Sherline Retrofit. Complete and ready to use. For information: (847) 998-0821. [9/97]

MODEL WARPLANES, 1996: over 10,000 plans, kits, photos, 3-views listed. Send SASE to John Fredriksen, 461 Loring, Salem, MA 01970 (508) 745-9849. [7/97]

REPLICA SWISS WATCHES—18KT gold-plated! Lowest prices! Two-year warranty! Waterproof divers, chronographs, others! Phone (770) 682-0609; fax (770) 682-1710.

SUNGLASS DISCOUNTS—Serengetti, RayBan, Randolph, Vuarnet, Gargoyles, Bolle, Revo, Hobie. Free catalogue. FJS Accessories (800) 226-7571. [9/97]

LARGE-SCALE SAILPLANES AND TOW-PLANES—new and used—call (212) 879-1634, Sailplanes Unlimited, 63 East 82nd St., New York, NY 10028. [11/97]

R/C SKYDIVING: Thrilling free-falls, chute opens by transmitter. Parafoil Parachute duplicates all canopy maneuvers, turns, stalls, spirals, landing flares, etc. Latest catalogue $1. R/C Skydivers, Box 662M, St. Croix Falls, WI 54024. [9/97]

PLANS—R/C sailplanes, scale, sport and electric. Old-timer nostalgia and FF scale and sport-powered, rubber and towline. All models illustrated. Catalogue $2. Cirrus Aviation, P.O. Box 7093, Depot 4, Victoria, BC V9B 4Z2 Canada. [9/97]

GEE BEE PLANS used for full-scale R-2, "Z." Ten airplanes, 1/3-1/24. Catalogue/News $4. Vern Clements, 308 Palo Alto, Caldwell, ID 83605; (208) 459-7608 [6/97]

MAKE REAL DECALS with your computer and printer. Send $10 for introductory kit to LABCO, Dept. MAN, 27563 Dover, Warren, MI 48093. http://www.mich.com/~labco/ [9/97]

NEW ZEALAND AERO PRODUCTS. Scale plans: Agwagon, Airtruk/ Skyfarmer, Pawnee, Pawnee Brave, Fletcher FU-24, DC-3/C-47, Cessna 152 Aerobat, Hall's Springfield Bulldog, Fairchild PT-19, Fleet PT-26, Rearwin Sportster, Typhoon and more. Hardware packs, color photo packs available. Free documentation with plans. Catalogue/Price List: $5 (U.S.); Visa/MC. 34 Ward Parade, Stirling Point, Bluff, New Zealand. Phone/24 hr. fax: 643-2128192. [3/98]

ENGINES FOR LESS: New and used save big money! O.S., SuperTigre, Fox, Enya, K&B, McCoy, Saito & more! All used engines come with lifetime tradeback guarantee! Consignment sales. Trade-in's, too! Send legal-size SASE or postage to get free list to: HWC, P.O. Box 94, Boystown, NE 68010. [8/97]

DETHERMALIZING CERTAINTY. For most free-flight models. Weighs .7 to 1.2 grams. Large SASE to Wheels & Wings, P.O. Box 762, Lafayette, CA 94549-0762. [10/97]

PLANS ENLARGING SOFTWARE—PLANS ENLARGING. Old magazines, scanning, plotting. Free information. Concept, Box 669A, Poway, CA 92074; (619) 486-2464. [7/97]

NORTHWEST AG AIRCRAFT now carries the New Zealand Aero Products award-winning plans, documentation and accessories here in the U.S. These are award-winning designs of the world's agricultural aircraft (and much more). Watch for future kits of other agricultural aircraft, including the Turbine Airtractor and the Turbine AgCat. Catalogue $5.00. Northwest AG Aircraft, Route 4, Box 576-28, Astoria, OR 97103. Ph./fax (503) 458-6686. [7/97]

WW I PLANS. Over 600 in stock. Laser-cut parts. Printed lozenge tissue. Send $5.00 for illustrated catalogue to Clarke Smiley, 23 Riverbend, Newmarket, NH 03857. [10/97]

DUCTED-FAN AIRCRAFT AND ONE SEAPLANE. Ready to fly. All built by George Miller of Custom R/C Aircraft. A-10, T-38, F-4, YF-22 and a Macchi MC-72 w/ counter-rotating prop drive. All featured in various model magazines. Call George (916) 689-4739. [8/97]

HELICOPTERS-BOLAR HELI RESEARCH. We build your heli, test your heli, repair your heli. Complete construction with new or your equipment. Also the best prices on helicopter kits, radio systems (Airtronics, Futaba, JR), engines and exhaust systems. Bolar Heli Research, 322 N. 7th St., Lehighton, PA 18235; (610) 377-4941; Email: bolar@mail.ptdprolog.net. [8/97]

AIRSPEED INDICATOR. This unit measures the highest speed achieved by your model during flight and reports the information after landing. Lightweight & accurate. Write or call for information and pricing: Hobbytech Inc. 34 Joslyn Dr., Elgin, IL 60120. Phone/fax (847) 695-5903. hobbytech@juno.com. [9/97]

SAITO ENGINE REPAIRS. Now available at A-Train Hobby by the Oldtimer. Other gas engine repairs also available. A-Train Hobby, 13503B Southeast Mill Plain Blvd., Vancouver, WA 98684; (360) 944-5403. [11/97]

BUSINESS FOR SALE: I have designed and developed an innovative product, sold through Tower Hobbies. However, I have neither the time nor resources to keep the business going. Serious inquiries please, to: APN 34 Joslyn Dr., Elgin, IL 60120. [8/97]

WE BUILD 'EM YOU FLY 'EM. We build trainers to ¼ scale. We will build to any stage of completion although we prefer to hand you a turnkey aircraft. Call or write for quote. T.P.H. Enterprises, P.O. Box 30, Twin Mt., NH 03595; (603) 846-2220. [7/97]

REDUCE HOBBY COSTS: FREE information on Major reduction in hobby costs. Request from: M. Dibbens - 101, POB 25, Norwich, KS 67118. [8/97]

NORTHWEST AG AIRCRAFT now carries the New Zealand Aero Products award-winning plans, documentation, and accessories here in the U.S. These are award-winning designs of the world's agricultural aircraft (and much more). Watch for future kits of other agricultural aircraft, including the Turbine Airtractor and the Turbine AgCat. Catalogue $5.00. Northwest AG Aircraft, Route 4, Box 576-28, Astoria, OR 97103. Ph/Fax 503-458-6686. [7/97]

WRING IT OUT! GULF STREAM DIRECT is the DIRECT source for the finest instructional videos available, kits and more! SPECIAL: Wring it Out! 3 volume set - $60.00 + $5.50 S&H. Smoke On! $22.50 + $2.50 S&H. Call 800-531-1784 to order. [8/97]

WINDSOCK/DATAFILES, PLANS & MAGAZINES can be ordered from one convenient source. We carry the complete line of Albatros publications, the Nexus Plans Handbooks, as well as many hard-to-find British modelling magazines. Call or write for details. Wise Owl Publications, 4314 W. 238th St., Ste. B, Torrance, CA 90505-4509; (310) 375-6258. [8/97]

FREE R/C FUEL TREATMENT SAMPLE! Eliminates harmful carbon and varnish. Reduces wear. Intensifies performance. FREE SAMPLE - LIMITED TIME OFFER! PMP, 10620 Nevada, Melrose Park, IL 60164. (847) 455-3923. [8/97]

BUSINESS FOR SALE: R/C scale model airplane kit manufacturer with 9 designs, whole or part. Flightech Models Inc., P.O. Box 422, Eagle, WI 53119. [6/97]

PRESSURE JET ENGINE GLUHAREFF G8-2 5 lbs. to 40 lbs. thrust, plus. Push-button starting. No moving parts. Propane powered. Successful multiple uses. 20 page illustrated catalogue $5.00. Jet Wind Company, 1624 Burnett St., Long Beach, CA 90806. (562) 427-2655, (213) 258-9313; Fax (562) 427-3126. [8/97]

LANDING GEAR PLANS: Build functional, spring-loaded gear for any size model. Send $7.50 shipping and handling to Jesse Lyon, 693 Park Rd., Morris Plains, NJ 07905. You will never use conventional gear again! [9/97]

PROP TALK- 96-page book on prop performance for model electric flight. Dialogue discusses propeller performance as a function of diameter, design, pitch and air density. Summarizes the results of seven experiments with propellers. PROP TALK also discusses how to systematically match a propeller to a motor-gearbox system to optimize/adjust electric system performance for takeoff power and flight duration. Includes thrust coefficients/performance curves for folding/fixed propellers for electric flying. Data based on actual measurements. Price $17.95 plus $2.50 shipping/handling ($20.45 check or money order) from ARPI, 900 Bower Dr., Idaho Falls, ID 83404. [6/97]

BUSINESS FOR SALE - Full line hobby/craft store, stable, est. 1980. Gorgeous north Rocky Mtn. location, exc. records, asking $60K + inventory. Call Russ (406) 257-1808. [8/97]

WANTED: Unbuilt plastic model kits of aircraft built/flown by Japan, books and plans about same. Send list, price to RCD, 90 Florence Ln., Fairfield, CT 06430. [8/97]

B.U.B.A.: (Built-Up Beginners Airplane) Learn to fly R/C with < $150. Easy to fly. Kits $29.95. For free brochure: Erbach R/C, 3507 King St., Regina, SK, Canada S4S 2J2. [9/97]

HOBBYIST

MAGAZINE BACK ISSUES—*American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM* and more; 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [9/97]

WANTED: Old, unbuilt, plastic model kits from '50s and '60s. Send list, price to Models, Box 863, Wyandette, MI 48192. [3/99]

SELLING MY COLLECTION of old model airplane motors, kits, books, magazines, toys, pictures, manuals and more. Send SASE for information. Ben LeValley, RT 3 Box 4868, Galena, MO 65656. [7/97]

WANTED: Built or partially built scale Cessna 150, 152, or 172. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; phone (714) 768-0585; fax (714) 458-6455. [7/97]

WANTED: Model engines and racecars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [10/97]

ENGINES: IGNITION, GLOW, DIESEL— new, used, collectors, runners. Sell, trade, buy. Send $3 for huge list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537. [11/97]

MODEL AIRPLANE NEWS, 1930-1980; "Air Trails," 1935-1952, "Young Men," 1952-1956; "American Modeler," 1957-1967; "American Aircraft Modeler," 1968-1975. $1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, B.C., Canada V0R 1L1.

CASH FOR ENGINES: ignition, glow, diesel—all types; any condition; sale list, too! Estates my specialty! Send SASE for list. Bob Boumstein, 10970 Marcy Plaza, Omaha, NE 68154; (402) 334-0122. [8/97]

WANTED: TOY OUTBOARD BOAT MOTORS. Johnson, Mercury, Orkin, Fuji, Scott, Oliver, Evinrude, Gale Soverign, Sea-Fury, Super Tigre, Lepage Monteleone. No plastic motors wanted. Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686-2802; Ph. (616) 941-2111. [8/97]

CONCEPT 30SR HELICOPTER engine type Super Tigre G-34H Radio - Futaba FP-T5NLH, power starter. Flown only twice, perfect condition. In college, need money. $1300 invested, asking $600. Make offer evenings & weekends (888) 503-6657. [8/97]

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TOY METAL OUTBOARD MOTORS WANTED: Johnson, Oliver, Mercury, Evinrude, Gale, Scott, Sea-Fury, Also want old airplane motors, Dooling, Pal Twin, etc. Gronowski, 140 N. Garfield, Ave., Traverse City, MI 49686-2802. Ph. (616) 941-2111. [8/97]

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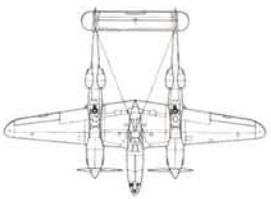

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Name THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606.

Congratulations to Hans Stevenfeldt of Prescott, AZ, for correctly identifying the April 1997 mystery plane. Hans easily recognized the Saab-21R single-seat, jet-engine Swedish fighter because he's building a 1/5-scale model of the Saab-21A—a propeller-driven version of the same aircraft.

Test-flown in 1947, the Svenska Aeroplan A.B. Saab-21R had a 38-foot, 1-inch wingspan; was 34 feet, 3 inches long; and 9 feet, 8 inches tall. The plane was of flush-riveted, all-metal construction, and it had retractable tricycle landing gear. Thanks to all who wrote in; good luck next month!

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

ADVERTISER INDEX

AUTOGYROS ON THE RISE

AUTOGYRO, AUTOGIRO, gyroplane, gyrocopter .... They all spell the same thing: fun! Promoting and enhancing the modeling of these fascinating and unique machines has been a several-year project of a few diehard modelers across North America and Europe. Not many years ago, an adventuresome modeler who dared to build a basic model with a rotor mounted on top was snickered at. No longer! Through the world of computer communications, a handful of modelers have met, compared notes and realized a like interest in conquering the mysteries of true autogyros and applying these lessons to working models.

As Juan de la Cierva struggled to invent the original autogiro back in the '20s, many problems slowed the progress of autogyro modelers. Not content to settle simply for a winged model airplane with a big rotor spinning on top, we strove to adapt the flapping and teeter-bar rotors of the full-size (wingless) autogyros to a practical flying model aircraft. Georges Chaulet, John Kallend and, more recently, Emilio Cabezas of Spain—the home of Cierva—gave us a solid foundation from which to begin. Emilio developed a fully direct "rotor-only controlled model"—no wing, no rudder, no elevator—and its performance was superb!

Steve Tillson built this Cierva C.4. It has a side-tilting rotor along with rudder and elevator controls.

In 1994, it was decided that the time had come to begin frequent gatherings (fly-ins) of gyro experimenters to fly and compare notes. This accelerated our progress and promoted a close comradeship between those who, up to that time, had only known one another as names on a computer screen. Agreeing to conduct a technical seminar as well as flying sessions, Steve Tillson of Phoenix, AZ, hosted the initial fly-in the spring of 1995. Modelers from all over the U.S. and as far away as England attended. This has led to an increase in the frequency of these fly-ins across the country. Presently, gyro enthusiasts are planning to converge on Martinsville, IN, this summer, at the invitation of host Richard Anderson. Emilio Cabezas will host the first International Fly-in in Madrid, September 1997. Longtime gyro modelers "JoJo" Chaulet and Alain Payeur of Paris, along with a few of the Stateside experimenters, plan to attend this unique event.

We experimenters have spent an enormous amount of time breaking dozens of rotor blades, scraping CA off our fingers, replacing broken propellers, digging models out of "smokin' holes" in the Arizona desert, the swamps in Georgia, the cornfields of Wisconsin, the pucker brush of Washington, and damaging our egos—all in an effort to solve the complexities of gyromodeling. Now we are beginning to see the light at the end of the tunnel and are preparing to offer a few plans and possibly a kit or two of everything from beginner models to beautiful scale machines for more advanced modelers.

Further experimentation with direct servo (tilting) control of the rotor is a current project of mine, along with a model that can also be completely disassembled and packed in your suitcase for travel. In the photo shown here, you will note the direct microservo connection to the rotor-head control and the lack of functioning elevator and rudder. While it appears rather simple, arriving at the correct measurements and angles to obtain a stable flying model has not been easy. Steve Tillson has been busy designing and developing scale flying models of several of the original autogyros of the 1920s and '30s and currently has flying models of a Cierva C.4 and a Kellet YG-1B. Plans are available; call Steve at (602) 582-9428. Bill Friedlander of Hudson, WI, is developing a "beginners package" to assist any modeling enthusiast, young or old, to get started in autogyro modeling. Richard Anderson of Gosport, IN—a true believer in "bigger is better"—has designed, built and flown large multi-rotor machines of such simple materials as aluminum downspout and foam. We experimenters all credit Ralph Kalb of Crystal Springs, FL, with much of the aerodynamics expertise necessary to complete these projects.

This is my Minnie-2. This 33-inch rotor model is controlled by tilting the rotor by direct servo connections. It can be completely disassembled and transported in a suitcase.

Using the Internet, the exchange of information has enhanced the recent surge in autogyro modeling. When an experimenter has a problem, an idea, or just a thought, an answer or potential solution is available. Anticipating a continued increase in autogyro modeling, we have established our own homepage on the Internet. You may find us at http://ourworld.compuserve.com/homepages/noeth. We also invite you to join us in the Compuserve/modelnet/autogyro forum as well as on the rconline.com/autogyro forum.

—Jim Baxter